# LQ3500

## 24 pin Dot Matrix Printer

## User Instructions

AMSTRAD

# Introduction

# AMSTRAD LQ3500

## Epson and IBM Compatible Letter Quality Printer

The LQ3500 is a high-performance, 24-pin, LQ (Letter Quality) printer.

It combines the versatility of an industry standard software instruction set with AMSTRAD's expertise in quality engineering.

Single cut sheet or continuous paper may be used, and the design allows the easy insertion and alignment of both tractor and friction feed paper. Printing speeds of up to 160 characters per second will make rapid work of even the most lengthy drafts.

The extremely wide choice of sizes and typefaces coupled with a complete ASCII, international and graphics character set should provide a solution to any printing problem. In addition, the implementation of dot addressable graphics and standard Epson compatible command codes will allow the LQ3500 to operate directly with most software, including word processors, spreadsheets and graphics programs.

The LQ3500 will operate directly with the AMSTRAD PC or other IBM PC-compatibles, as well as the AMSTRAD CPC range of computers, the AMSTRAD PCW9512 word processor and the Sinclair ZX Spectrum +3. It will also operate with any other computer which incorporates a standard parallel printer interface (such as the Acorn range of BBC microcomputers).

In addition, the printer may be used (via an AMSTRAD CPS8256 interface) with the PCW8256 and PCW8512 word processors, or (via some other suitable interface) with computers that normally use serial printer output (such as the Commodore range of computers, or the older models in the Sinclair Spectrum series, eg. the Spectrum 48 or 128).

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We ask that all users take care to submit their user registration/guarantee cards.

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Acknowledgements to Acorn, BBC, CBM, Centronics, and Epson

First Published 1987

Written by Vik Olliver and Ivor Spital

Typeset by Kamset of Brentwood
Published by AMSTRAD



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# IMPORTANT

## You must read this....

1. Always connect the mains lead of the printer to a 3-pin plug following the instructions in chapter 1.

2. Do not attempt to connect the printer to any mains supply other than 220-240V AC 50Hz.

3. There are no user serviceable parts inside the printer - DO NOT ATTEMPT TO GAIN ACCESS INSIDE THE CASING. Refer all servicing to qualified service personnel.

4. Do not operate the printer with its ribbon removed.

5. Do not operate the printer with no paper loaded.

6. Do not switch on or operate the printer with the cardboard print head stabiliser in position.

7. Do not bring drinks or any other liquids near the printer. If you *do* accidentally spill liquid on the printer, immediately remove the mains plug from the supply socket and consult your dealer.

8. Do not block or cover the ventilation slots in the cabinet.

9. Do not use or store the printer in excessively hot, cold, damp, or dusty areas.

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# Chapter 1
# Open the box....

Subjects covered in this chapter:

How to wire up the mains plug
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Fitting the ink ribbon
Connecting the printer to your computer
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How the controls work
First steps in printing

## Unpacking your printer

In addition to the LQ3500 printer and this manual, you will also find the following items within the packing pieces:

A printer ribbon (inside the left foam end-piece).
A printer cable (not supplied in some countries).
A tractor feed assembly (inside the right foam end-piece) together with some small plastic brackets.
A metal rod (at the back of the printer).
Make sure that you do not accidentally discard any of these items during unpacking.

## Fitting a mains plug to your printer

The LQ3500 operates from a 220-240 Volt AC 50Hz mains supply. Fit a proper mains plug to the mains lead of the LQ3500. If a 13 Amp (BS1363) plug is used, a 3 Amp fuse must be fitted. The 13 Amp fuse spplied in a new plug must NOT be used. If any other type of plug is used, a 5 Amp fuse must be fitted either in the plug or adaptor or at the distribution board.

**WARNING: THIS APPARATUS MUST BE EARTHED**

IMPORTANT: The wires in this mains lead are coloured in accordance with the following code:

| | |
|---|---|
| **Green-and-yellow** | **: Earth** |
| **Blue** | **: Neutral** |
| **Brown** | **: Live** |

As the colours of the wires in the mains lead of this apparatus may not correspond with the coloured markings identifying the terminals in your plug, proceed as follows:

The wire which is coloured **GREEN-AND-YELLOW** must be connected to the terminal in the plug which is marked by the letter **E** or by the safety earth symbol ⏚ or coloured green or green-and-yellow.

The wire which is coloured **BLUE** must be connected to the terminal which is marked with the letter **N** or coloured black.

The wire which is coloured **BROWN** must be connected to the terminal which is marked with the letter **L** or coloured red.

Disconnect the mains plug from the supply socket when not in use.

Do not attempt to remove any screws, nor open the casing of the LQ3500. Always obey the warning on the rating label located on the underside of the unit:

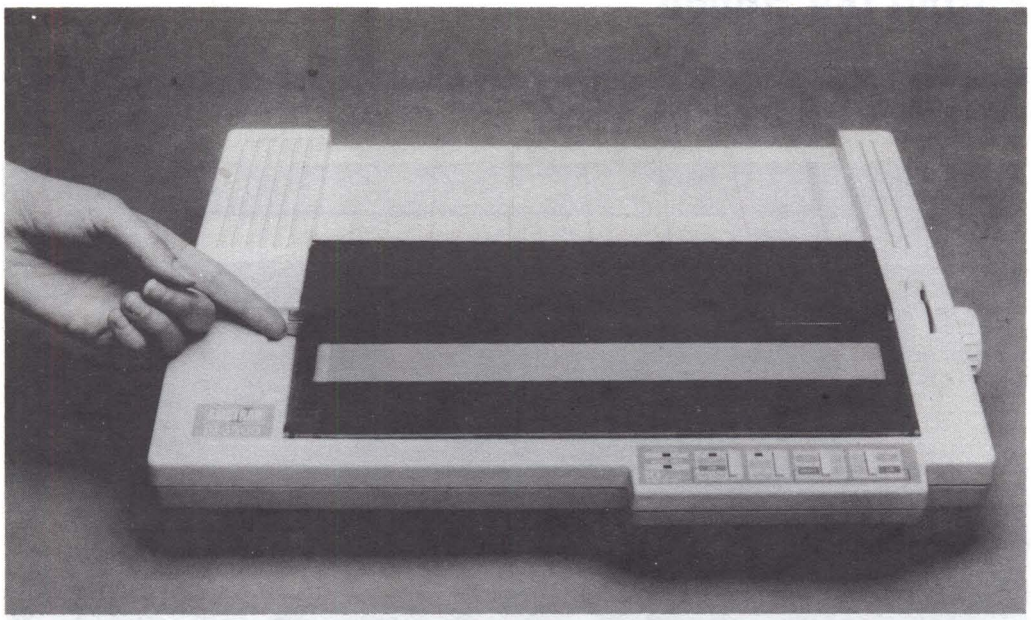
**WARNING:**
**LIVE PARTS INSIDE - DO NOT REMOVE ANY SCREWS**

# Preparing your printer

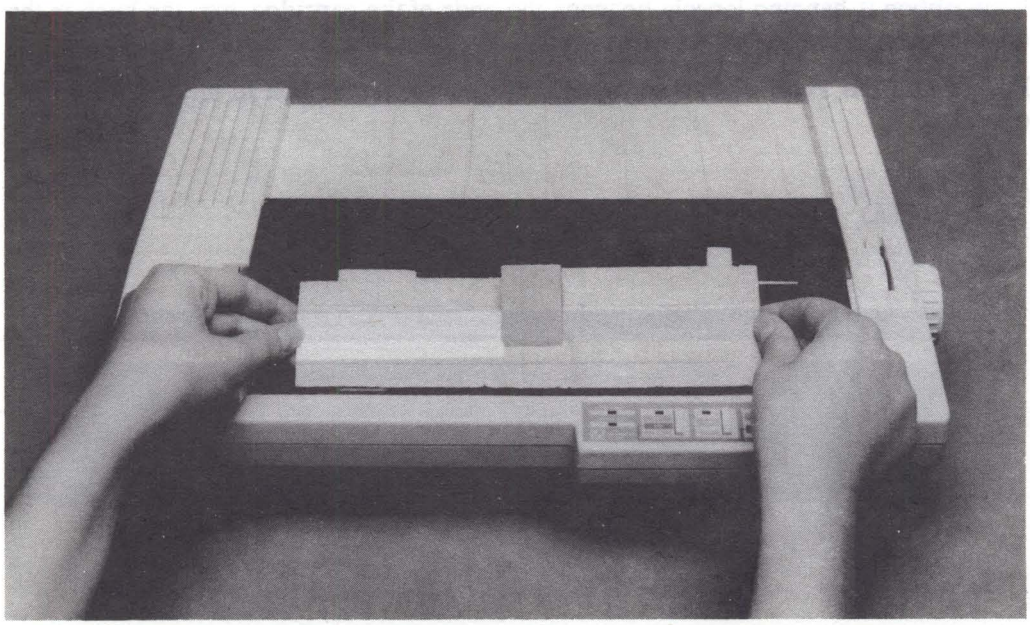
Now that you've fitted the mains plug, you'll no doubt be anxious to plug in, switch on, and start printing.... DON'T! There are a number of important preparations yet to be made, and it is vital that you carry out the following instructions first, or you'll damage the printer before you get started:

# Removing the cardboard print head stabiliser

Raise the plastic cover at the front of the printer by simply lifting the tab on the left hand edge, closest to the roller. To replace the cover, you just lower it again.



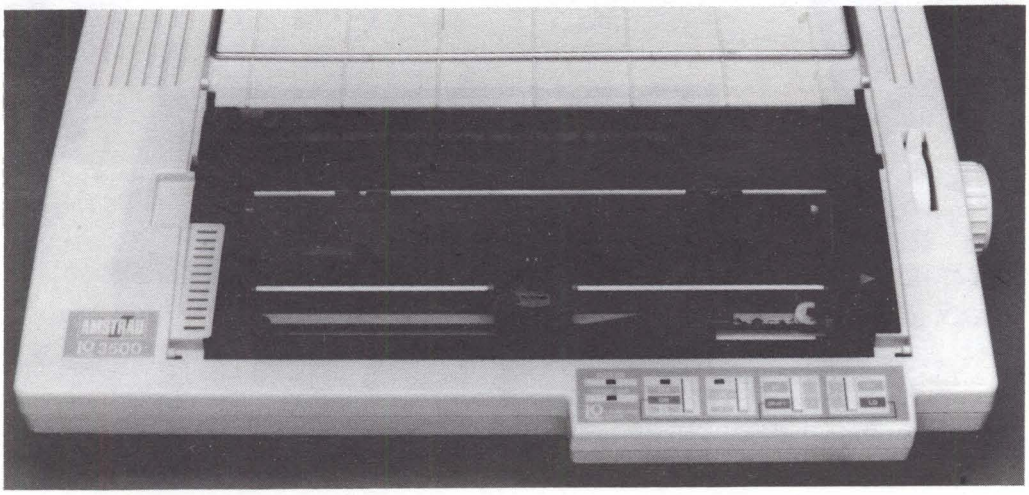
Now remove the cardboard print head stabiliser by lifting it out of the printer.



If the cover comes off in your hands, lay it flat where it should go, and press gently on the two corners closest to you. You should feel it click into place.

# Fitting the ribbon

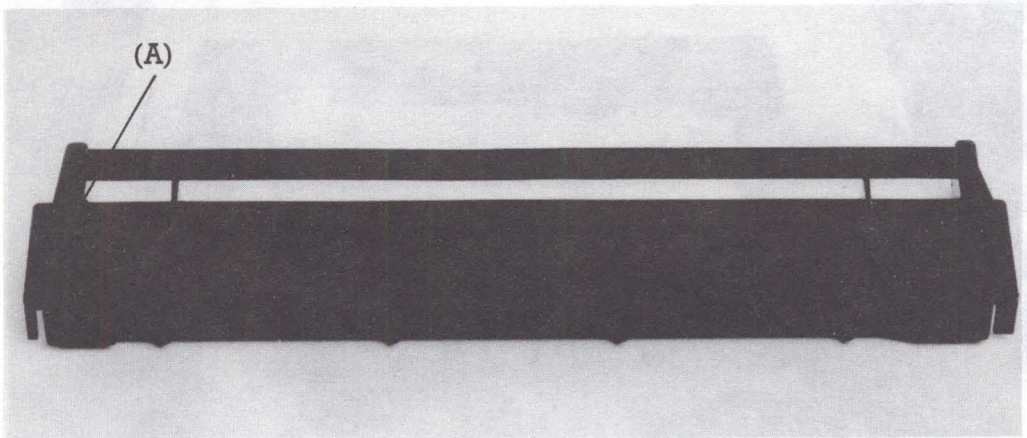
Fitting the ribbon is a good idea, otherwise you won't be able to print much! This is how you fit it:



Carefully unpack the printer ribbon cassette, taking care not to touch the ribbon with anything you'd like to keep clean.

If the ribbon is hanging loosely between the ends of the cartridge, turn the knob in the top of the cartridge (A) anti-clockwise until the ribbon is a little more taut.

Do not turn the knob clockwise, as this may cause the ribbon to unwind inside the cartridge.



On top of the cartridge is a small schematic diagram, showing the path of the ribbon. Position the ribbon just like it shows, ensuring that it passes between the print head and the small shield in front of it. To settle the cartridge down, press down gently and rotate knob (A) a few times in an anti-clockwise direction.

You can now put the front cover down again.

## Ribbon removal and replacement

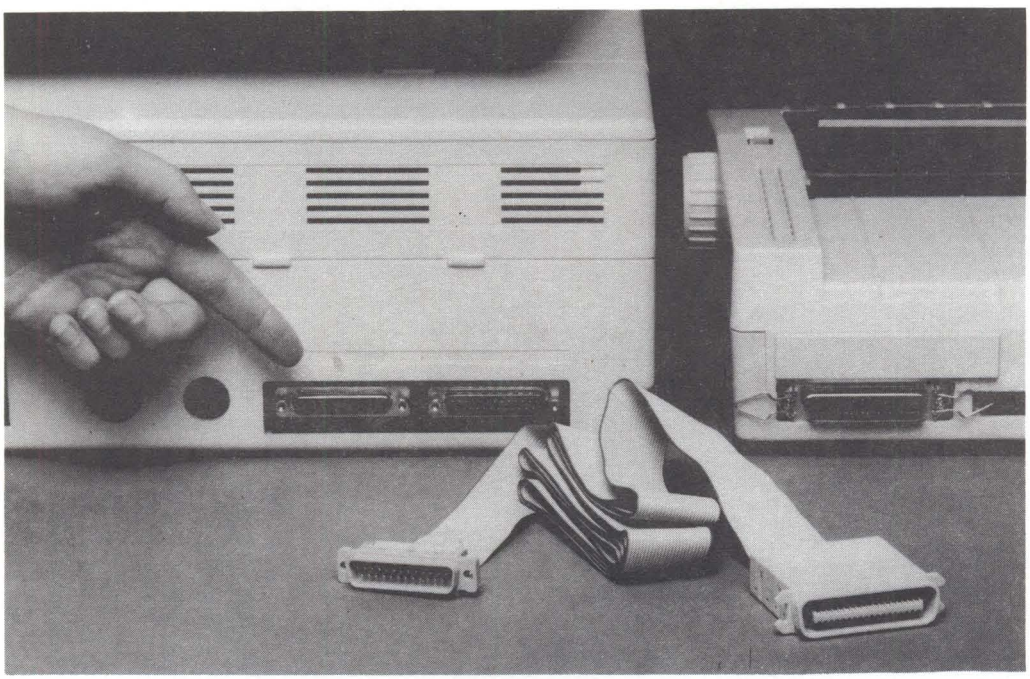
Should you wish to remove or replace the ribbon at any time, simply reverse the fitting process just described.

## Connecting the printer to a PC

To connect the LQ3500 to a PC (such as the AMSTRAD PC) you will require a suitable lead (the AMSTRAD PL-2 or any other equivalent IBM PC to Centronics printer lead).

Position your LQ3500 on a flat even surface, close to your PC. Make sure that both the printer and your PC system are switched off.

Connect the large Centronics plug (at the end of the printer lead) into the rear socket on the printer. If the Centronics plug has a cut-out in each side, you may fasten the printer's locking-clips into the cut-outs.



Connect the other (smaller) end of the printer lead into your PC. If you are connecting the LQ3500 to an AMSTRAD PC, use the socket marked PARALLEL PRINTER at the rear of the PC system unit.

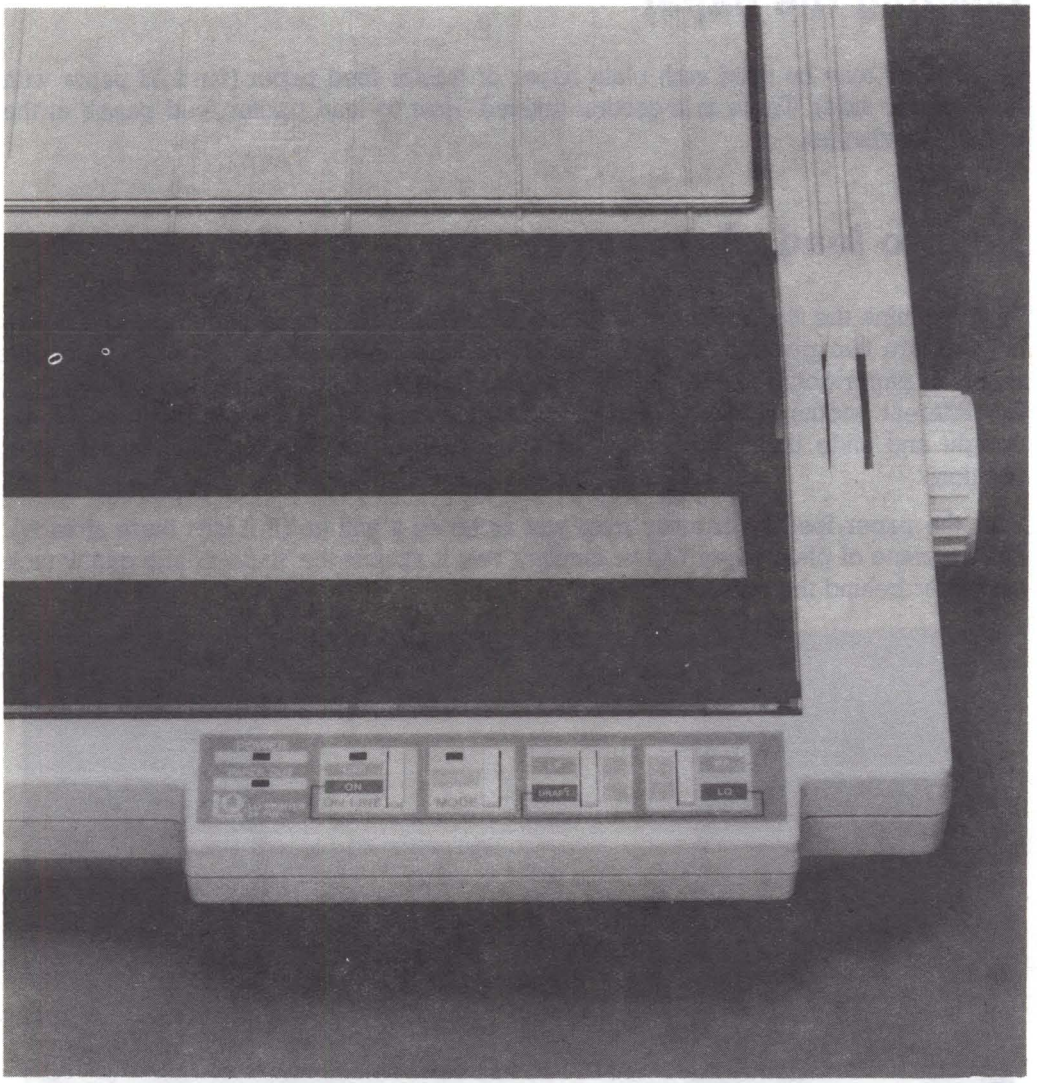
## Connecting the printer to a home computer

Should you wish to use the LQ3500 with a computer such as one of the AMSTRAD CPC series, the Sinclair ZX Spectrum +3 or the Acorn range of BBC microcomputers, all you will require is a lead to connect the LQ3500 to the PRINTER socket on the computer. (The AMSTRAD PL-1 printer lead is suitable for AMSTRAD CPC computers and the Spectrum +3.)

For the Commodore or older Sinclair Spectrum range of computers, you will require a suitable Centronics parallel interface for your computer.

## Getting to know your printer

Take a good look at your printer. You'll be switching it on very shortly now, and it's just as well to get acquainted with the names of all the buttons, knobs, switches, levers, and lamps beforehand.




# Switching on

Switch on your computer system, then set the LQ3500 mains ON/OFF switch (at the rear left-hand side of the printer) to *on*. The print head will move about for a few seconds, and you will then hear a high-pitched bleeping sound. This sound is the paper out alarm, but do not worry about it for the moment. After the alarm has stopped, you will note that the POWER lamp and the PAPER OUT lamp are both on.

All that has to be done now is to load the paper, then you can start printing. First, decide which type of paper you are going to load into it.

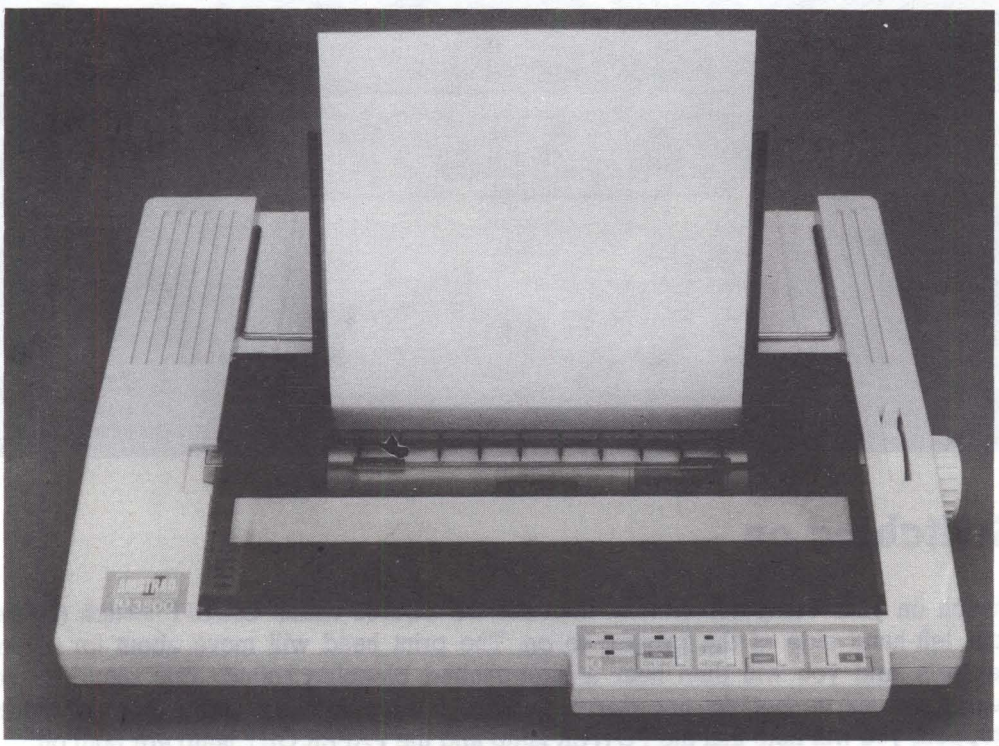
# Loading the paper

The LQ3500 may be used with plain paper or tractor feed paper (fan fold paper with holes at the side). There is a section entitled 'How to load tractor feed paper' at the end of this chapter.

# How to load plain paper

First, examine the slot in the top of the printer. This is where the paper goes in. Inside this slot are two pivoting 'fingers'. You point these upwards and use to prop up the sheets of paper going into the paper feed slot. These 'fingers' slide to the left and right for different widths of paper and for different left margins. To use them, pull them upright and slide their bases together about half an inch or so. They then lock in position.

Push the paper feed lever away from you as far as it will go (if it isn't there already). Take a piece of plain paper (A4 or similar), rest it against the 'fingers', and gently tuck the paper behind the roller.



Smoothly pull the lever towards you all the way, and hold it there. The paper will now be automatically fed through, first slowly, and then rapidly. After this, the PAPER OUT light will go off.

To finish off, push the lever all the way forward, and straighten things up by hand if necessary.

(Note that the position printing takes place on the paper, is directly under the print head.)

## Paper thickness adjustment

Once the paper is loaded, you may adjust the red paper thickness lever to a suitable setting - backwards for thicker paper (or two sheets); forwards for thinner paper.

Note that moving the paper thickness lever forwards will darken the printing; moving it backwards will make the printing lighter.

On the black plastic shroud next to the paper thickness lever are some markings. Normally, the lever would be on or near the star * mark. If 2-ply or thick paper is being used, the lever would be moved down two or three notches. The last notch is for exceedingly thick paper (such as the heavier types of legal parchment). Marks above the star are for factory testing only, and using them will tend to jam or damage your printer.

If you are already experienced in using a printer with a computer and know how each of the controls work, then you may skip to the next chapter (or to the section entitled 'How to load tractor feed paper' at the end of this chapter).

# Moving the paper

Once the paper is loaded, you may advance it through the printer by using the LF (Line Feed) button. Pressing the LF button once advances the paper by one line; holding the button down allows you to advance the paper continuously until you release the button. The FF (Form Feed) button will allow you to advance the paper by one page at a time. The use of this button will be explained shortly. The LF and FF buttons will move the paper only when the ON LINE lamp is off.

You may at any time advance the paper by using the manual paper feed knob instead of the LF and FF buttons, but the printer will then still print as if the paper had not been moved. For example, when it feeds a new sheet, it may not line up at the top correctly.

# Starting printing

The LQ3500 incorporates a *self test* facility whereby all the ASCII characters are automatically printed in either draft or LQ (letter quality) mode. To try this out, first set the mains ON/OFF switch to *off*. Now, holding down the LF button, set the mains ON/OFF switch to *on*. Release the LF button, and self test printing will start and continue until either the paper runs out, or the mains is switched off.

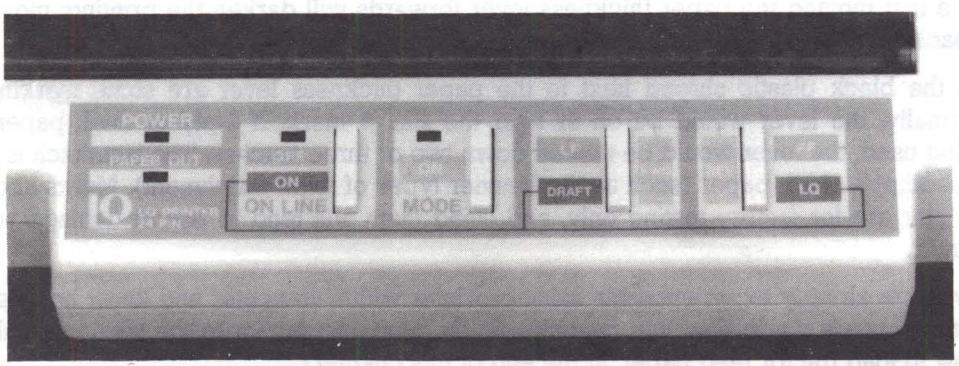
After four or five lines of self test printing, set the mains ON/OFF switch to *off*.

Have a look at what's been printed. If the characters have not been printed clearly and evenly, check that you have installed the ribbon and paper correctly.

To print-out a self test in LQ (letter quality) mode, repeat the procedure, but with the FF button pressed instead of the LF button.

After four or five lines of self test printing in LQ mode, set the mains ON/OFF switch to *off*.

Now switch the printer back *on* again. Assuming that you still have some paper loaded in the printer, notice that when you switch on this time, the paper out alarm does NOT come on, and the ON LINE lamp is lit.



## What does 'on line' mean?

'On line' means that the printer is ready to print (as soon as it receives a command from the computer). Note that when the printer is on line, you won't be able to move the paper using the LF or FF buttons. What you must then do is press the ON LINE button once (so that the ON LINE lamp goes off). This is known as setting the printer 'off line', and you will then be able to advance the paper using the LF and FF buttons. So briefly, the rule is: on line to print; off line to stop printing ready to move the paper.

## The FF button

The FF button may be used to advance the paper through the printer by one whole page.

To demonstrate, set the printer off line, then press the FF button. Watch what happens to the paper.

Form feed is very useful if, for example, you've just printed a letter to somebody and you wish to run it out from the printer.

If you are using tractor feed paper (explained at the end of this chapter) you may use the FF button to advance the paper by one page's length.

## The MODE button

This changes the function of the FF and LF buttons slightly. When the MODE button is repeatedly pressed, the MODE light goes on and off. When the MODE light is off, the LF and FF buttons perform as just described. When the MODE light is on, however, the LF button causes the paper to move very slowly (1/180 inch at a time) through the printer, and the FF feeds the paper *backwards* through the printer, one line at a time.

Two points to note about the alternative modes of operation: firstly, don't feed tractor paper backwards; secondly, remember that feeding paper with the alternative mode set does not take into account where the printer 'thinks' the top (or bottom) of the page is.

## Print your first word

Load a piece of paper into the printer.

Press the ON LINE button, and make sure that the ON LINE lamp is lit.

From now on, you will be shown various example printer commands (in BASIC) to type into your computer. These commands will be compatible with the BASIC provided with most PCs, ie. IBM BASIC, Microsoft BASIC, Locomotive BASIC 2 (provided with the AMSTRAD PC), Mallard BASIC, BASIC-A, etc.

So the first thing to do is to start up BASIC on your PC. Having done so, send a word (for example 'hello') to the printer by typing the following instruction into the computer:

```
LPRINT "hello"
```

The word 'hello' (or whatever you typed inside the quotation marks) should have immediately been printed-out by the LQ3500. If it hasn't, then check that you pressed the ↵ (**[Return]** or **[Enter]**) key on your computer after typing in the instruction. If nothing still was printed, then check that the lead between the printer and the computer is correctly fitted at both ends, that the paper is correctly loaded, and that the printer is on line (the ON LINE light should be on).

Well, you have now set up the LQ3500 and printed your first word. The next chapter goes on to describe some of the simpler printing functions, and will introduce you to some of the alternative styles of printing that the LQ3500 is capable of.

Finally in this chapter....

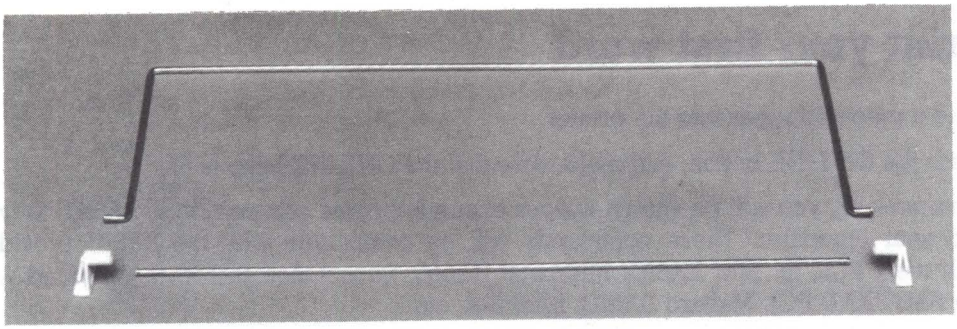
# How to load tractor feed paper

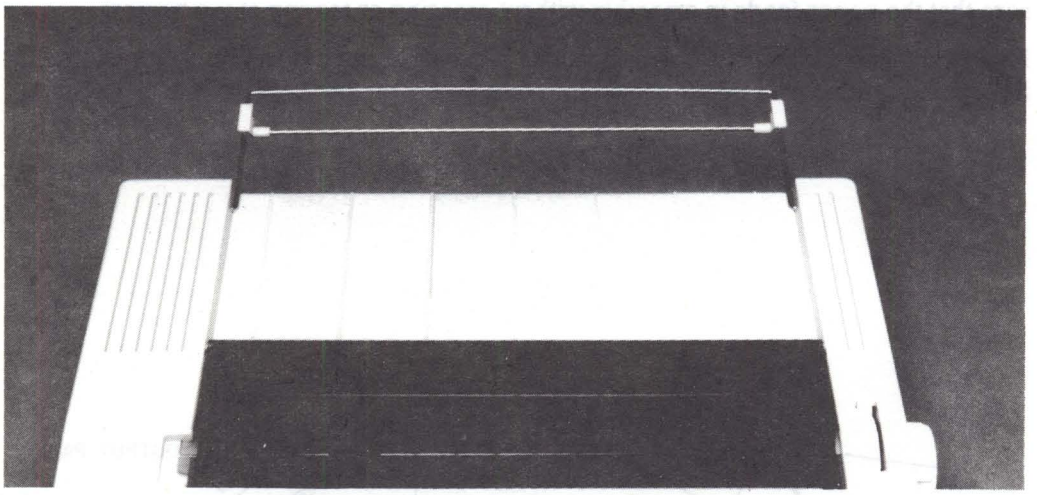
In the packaging was a long assembly with two plastic cogged wheels on it. This is called the tractor mechanism. The two outer plastic wheels are called tractors, and they may be moved left or right to accommodate the size of paper you are using. The inner plastic wheel supports the middle of the paper and may be slid to any suitable position, usually the centre.

Tractor feed paper is useful if you want to print program listings or long continuous texts. Before loading the paper into the printer, you will need to assemble the paper separator from the parts supplied. The bits you need are:

The metal bracket
The metal rod
The two plastic brackets

To construct the separator, fit a plastic bracket onto each end of the metal rod, then slide the open ends of the fingers into the arms of the metal bracket





The paper separator prevents paper that has just been printed onto from going back into the printer again. (When this happens, your printout is messed up, and the roller gets totally wrapped in paper. It is therefore a good idea to fit the separator whenever you use tractor feed paper. Fit it now.)

Now you need to fit the tractor mechanism on top. First, remove the cover with the slot down the middle (usually positioned over the roller). This is removed by raising the cover so that it is pointing straight upwards, then lifting it off.

Next, take the tractor mechanism and slot the small plastic clips (at the front) into the holes near each end of the bail bar. Once they are in, you can hinge it back and apply gentle pressure until it clicks into place. Don't worry if it pushes the bail bar slightly forwards - it's supposed to do that.

Load the paper into the printer (as described earlier for plain paper), then wind it on until enough paper is emerging to reach the tractor mechanism.

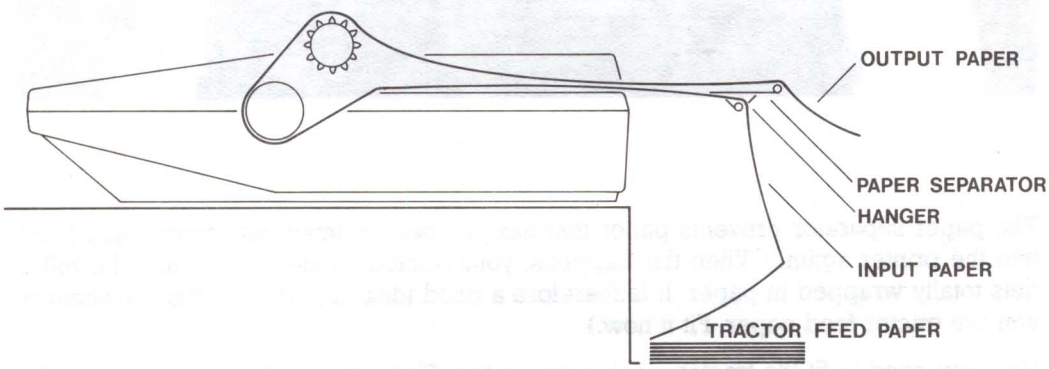
The paper passes underneath the separator on the way in, and passes over the top of it on the way out. This stops the paper that has just been printed onto diving back into the printer again. While this would be economical on paper it would not be very useful! Hence the separator.

Flick open the covers on the tractor wheels to expose the paper locating cogs. Now line up the paper holes with the cogs, and if necessary, slide the tractors sideways to accommodate the size of paper being used.

Make sure that the round plastic piece in the middle of the tractor mechanism is placed half way between the tractors.

Place the paper over the cogs and close the tractor covers. Wind the paper through the printer a little more (using the LF button or the manual paper feed knob) making sure that the paper feeds in smoothly without creasing or tearing at the tractors.

Make sure that the printed output paper is allowed to run out freely, and pile directly behind the printer. The paper should fold one way, then the other, as it piles like this:




When taking off the tractor mechanism, ALWAYS remove it by tilting the rear of the plastic end-pieces towards you. NEVER use force on the tractors, tractor covers or metal bars - you might damage them.

# Chapter 2
# Simple printing exercises....

Subjects covered in this chapter:

Printing and listing in BASIC
Notation used in this manual
Printing DOS files
Wildcards
Listing the disk directory to the printer
Echoing screen output to the printer
Printing a screen dump
Printing GEM files
Printing DOS Plus and CP/M files
The print buffer
Default character set
The DIP switches
How to print international characters
How to change to an alternative typeface
Control codes

## Printing in BASIC

Having set up the LQ3500 and printed a word or so, you'll by now have gathered that to send text to the printer, you simply use the BASIC command `LPRINT` followed by the text you wish to print (inside quotes). This not only applies to the printing of constant strings (such as that shown in the previous example), but also to any combination of string variables, numbers, numeric variables, or control codes (more about these things later).

Formatted printing may also be executed using the options: `LPRINT TAB`, `LPRINT SPC`, `LPRINT USING` and `ZONE`.

Consult your BASIC manual about the use of these commands, and find out which are used on your computer.

When using Mallard BASIC, pay special attention to the `WIDTH LPRINT` and `OPTION NOT TAB` commands, as these have caught out the most experienced programmers many times.

# Listing a program in BASIC

BASIC programs may be listed to the printer. Simply type in:

```
LLIST
```

(Don't forget to always press the ↵ **[Return]** or **[Enter]**) key on your computer after typing in an instruction.)

Alternatively, you may list a specific line (or range of lines).

Example commands (together with their meanings):

```
LLIST 20-50    (list from line 20 to line 50)
LLIST -200     (list from beginning of program to line 200)
LLIST 80-      (list from line 80 to end of program)
```

Some BASICs treat the printer as an output stream or file. So, to list on, say, an Amstrad CPC machine, you would use:

```
LIST #8
```

....or:

```
LIST 20-50, #8
```

To list a program to the printer under Locomotive BASIC 2 (supplied with the AMSTRAD PC), use the mouse to pull down the `PROGRAM` menu, then select the `LIST` option.

# Notation used in this manual

**IMPORTANT:** Before we go on to showing you some more example commands, you should note that from now on in this manual, an item shown in angled brackets, eg. ‹item› is NOT to be typed-in literally; the item merely represents the *sort* of information to be entered. Hence, where the manual gives an example command:

```
PRINT ‹filename›
```

....you would typically type in:

```
PRINT letter.jim
```

....where 'letter.jim' is the filename.

Furthermore, items shown in square brackets, eg. [‹another item›] are optional and need not be entered unless required. Hence, where the manual gives an example command:

```
PRINT [‹drive›:]‹filename›
```

....you may typically type in:

```
PRINT letter.jim ....or.... PRINT a:letter.jim
```

....where 'letter.jim' is the filename and 'a' is the (optional) drive. The : colon (which is NOT in angled brackets) *must* be typed-in literally if the optional part of the command is used.

NOTE: The next section in this manual deals with printing *non-BASIC* files under the operating systems: MS-DOS, PC-DOS, GEM, DOS Plus and CP/M. If you are only interested in printing from BASIC, then skip to the section ahead entitled 'Back to BASICs'.

# Printing DOS files

Under MS-DOS, PC-DOS or DOS Plus, files may be printed-out using the following commands:

```
PRINT [‹drive›:][‹path›]‹filename›
```

The path is a directory name, or several directory names, each ending in a '\'. Directories, in case you have not used them before, are a way of organising your drives into conveniently-sized chunks.

Example command:

```
PRINT a:autoexec.bat
```

....which will print-out the file 'autoexec.bat' (if it is present on the disk currently in Drive A:).

You may then see a prompt on the screen similar to:

```
Name of list device [PRN]:_
```

....whereupon you should press ↵ (**[Return]** or **[Enter]**). Further messages about the operation in progress will appear on the screen, and the specified file will be printed-out by the LQ3500. Alternatively, you may use the `COPY` command to send the file to the printer, ie:

```
COPY [‹drive›:][‹path›]‹filename› PRN:_
```

Example command:

```
COPY a:autoexec.bat PRN:
```

After a file is printed-out, a message similar to:

```
1 File(s) copied.
```

....will appear on the screen.

It is *not* a good idea to try to print out files with names ending in any of the following:

```
.EXE
.COM
.BAS
.APP
.LIB
.REL
.GEM
.IMG
```

These are files with special meaning to the computer, and are not meant to be read by humans (or printers for that matter).

# Wildcards

In each of the above types of command, 'wildcards' may be used to specify a range of files to print-out, rather than just one.

There are 2 types of wildcard: ? and *. The ? question mark wildcard may be used to represent 1 character in a filename which has any value. For example, the filename `B?D.B?G` could specify any number of files, eg: `BAD.BAG`, `BED.BUG`, `BID.BIG`, `BUD.BOG`, `BCD.B3G`, `B4D.BEG`, etc.

The * asterisk wildcard may represent any group of characters up to the end of the filename field. For example, the filename `B*.*` could specify any number of files, eg: `BIG.TOE`, `BINARY.DTA`, `BREATHE.IN`, `B.TRE`, `BLAST-IT.` etc. Notice how in the last example (`BLAST-IT.  `) the * wildcard specified represents no characters at all. This is a perfectly valid use of the wildcard. Finally, the filename `*.*` means *all files.*

With wildcards in mind, therefore, you may print-out, for example, all '.BAT' files, using either of the commands:

```
PRINT a:*.bat
```

....or....

```
COPY a:*.bat PRN:
```

# Listing the disk directory to the printer

The disk directory may be listed to the printer (under any of DOS systems provided with your PC) by typing the command:

```
DIR >PRN
```

Alternatively, you may switch 'printer-echo' on (described in the next section) and list the directory to the screen.

# Echoing screen output to the printer

The **[Ctrl] P** function may be used to echo screen output to the printer, ie. whatever is written to the screen is also printed-out by the LQ3500. Some programs (such as word-processors) may access the screen directly. If you want hard copy of something produced in this manner it is possible (see the section on screen dumps).

To switch printer-echo on, hold down the **[Ctrl]** key on your computer and press the **P** key once; then release both keys.

To switch printer-echo off, simply press **[Ctrl] P** again.

Until you cancel the first **[Ctrl] P** by pressing **[Ctrl] P** a second time, *everything* which is written to the screen (including > prompts, control codes, and error messages) will be printed-out by the printer. (Note that pressing **[Ctrl] P** doesn't itself produce a printed character on the screen.)

To experiment with printer-echo, press **[Ctrl] P** and type:

```
DIR
```

....then press **[Ctrl] P** again.

# Printing a screen dump

(Providing the facility is installed within the operating system you are currently using on your PC), you may *dump* the entire contents of the screen (as you see it) to the printer, using the ⇧ (shift) **[Prt Sc]** function.

Simply hold down the ⇧ (shift) key and press the **[Prt Sc]** key once.

For detailed graphics screens, use the utility GRAPHICS (see your DOS manual) first.

# Printing GEM files

GEM files may be printed-out using the 'Print Spooler' or 'Output' option from the GEM Desktop menu. For further information, see your PC manual.

# Printing DOS Plus and CP/M files

Under the DOS Plus and CP/M operating systems, files may be sent to the printer using the PIP command. The form of the command is:

```
PIP LST:=[‹drive›:]‹filename›
```

Example command:

```
PIP LST:=a:autoexec.bat
```

....which will print the file 'autoexec.bat' (if it is present on the disk currently in Drive A:).

Unlike MS-DOS and PC-DOS, you may NOT specify wildcards within the filename using the above command.

# Back to BASICs

Welcome back to those of you who skipped here from earlier in the chapter. We are now going to explore the features of the LQ3500 and you should note that from here-on, all the example commands will be shown in BASIC.

So, if you haven't already done it, now is a good time to start up BASIC on your PC and get ready to type in some commands.

# The print buffer

Before printing any characters on the paper, the printer stores incoming information in an area of its own memory called the *print buffer*. In previous examples, the reason that the printer has printed-out everything it has been instructed to (rather than holding it in the buffer) is because each print statement has been automatically followed by a carriage return and line feed (this is executed by default) which has the action of emptying (or *flushing*) the buffer.

To explain the above, compare the following:

```
10 LPRINT 123
20 LPRINT 456
30 LPRINT 789

RUN
```

When you run this program, the LQ3500 prints-out:

```
123
456
789
```

Now modify lines 10 and 20 as follows, and run the program again:

```
10 LPRINT 123;
20 LPRINT 456,
30 LPRINT 789

RUN
```

This time, you will see that the LQ3500 prints-out:

```
123 456 789
```

The numbers have been printed-out on one line because the semicolon and comma have suppressed the carriage return/line feed to the printer. The data to be printed (in lines 10 and 20) have been held inside the print buffer until the whole line has been printed-out by an 'un-suppressed' `LPRINT` command (line 30).

REMEMBER: The `LPRINT` command (when it is not terminated by a semicolon or comma) automatically executes a carriage return and line feed.

Note that the buffer will always be flushed under the following conditions:

1. When the printer is set off line.
2. When the printer receives a line feed.
3. When the buffer is full.
4. When the pitch or print style is changed.

# Default character set

By default, the LQ3500 is supplied to you factory-set to reproduce the Epson-style character set as detailed in appendix 2.

Type in the following test program to print-out part of the default character set:

```
10 FOR n=32 TO 126
20    LPRINT CHR$(n);
30 NEXT
40 :
50 FOR n=160 TO 254
60    LPRINT CHR$(n);
70 NEXT
80 LPRINT

RUN
```

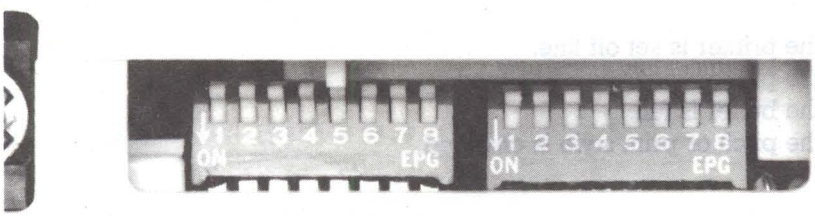
** ‹‹ USE PRINT-OUT FROM ABOVE PROGRAM HERE (LEAVE 1 INCH) ››

The quality of the output can be changed by using a series of miniature switches (called DIP switches) at the rear of the printer.

As well as choosing between standard typeface (draft quality) and letter quality, you can also select character sets for various countries, choose whether the zero has a slash through it, silence the bleeper, and other such things.

# How to adjust the DIP switches

**IMPORTANT:** Always switch the printer *off* before adjusting the DIP switches. Apart from any electrical considerations, the settings of the DIP switches are scanned only when the machine is first switched on.



If you look carefully, you will note that there are 2 blocks (or banks) of 8 switches each. Each individual switch is numbered, and on the corner of each bank, you will see the word 'ON' (showing you the direction to switch on).

Switch number 7 in bank 1 is the one that changes the quality of the print. If you want to print fast, set it to 'OFF'. If quality is more important to you than speed, set it to 'ON'. For the moment, let's leave it in the 'OFF' position.

NOTE: The default character set may be selected via software. This method is described in chapter 6 ahead, under the section entitled 'Character table selection'.

(You will often hear the term *ASCII* used when referring to characters or character sets - note that ASCII stands for American Standard Code for Information Interchange.)

# International characters

If you are using a PC, then just select IBM character set #2 on your LQ3500, and the applications software (eg. your word processor package) will automatically print-out international characters when required.

If your LQ3500 is connected to a *non PC-compatible* computer (or a PC running applications software that is only able to handle 7-bit characters), then in order to print international characters, you must use certain characters which may take on a number of different 'identities'. To illustrate, type in the command:

```
LPRINT "#"
```

The LQ3500 will print-out:

```
#
```

The # hash sign is printed-out because the LQ3500 is supplied to you factory-set to reproduce the *USA* character set by default (see the table on page 32).

Now look at the fourth row down on that table. In the first column (next to 'UK') you will see a £ pound sign. This means that if the LQ3500 is set to reproduce the *UK* character set, you will be able to print £ pound instead of # hash.

The three DIP switches that control the selection of international character sets are numbers 1, 2 and 3 on the first bank (DS1). Using the same convention as before, these switches will be referred to as DS1-1, DS1-2 and DS1-3.

The following table indicates the settings of DS1-1, DS1-2 and DS1-3 to select the required international characters:

| COUNTRY | DS1-1 | DS1-2 | DS1-3 |
|---|---|---|---|
| **USA** | **OFF** | **OFF** | **OFF** |
| **France** | **OFF** | **OFF** | **ON** |
| **Germany** | **OFF** | **ON** | **OFF** |
| **UK** | **OFF** | **ON** | **ON** |
| **Denmark** | **ON** | **OFF** | **OFF** |
| **Sweden** | **ON** | **OFF** | **ON** |
| **Italy** | **ON** | **ON** | **OFF** |
| **Spain** | **ON** | **ON** | **ON** |

Switch the printer off and adjust the DIP switches to the *UK* setting (DS1-1 *off*, DS1-2 *on*, DS1-3 *on*), then switch the printer on again.

Again, type in the command:

```
LPRINT "#"
```

....and you will see that the LQ3500 has now printed-out:

£

Here is a table of the available international characters:

| CHARACTER CODE (HEX) |
|---|
| **USA** |
| **France** |
| **Germany** |
| **UK** |
| **Denmark** |
| **Sweden** |
| **Italy** |
| **Spain** |

** ‹INSERT PRINT-OUT NO. 1 HERE›

NOTE: International character sets may also be selected via software. This method is described in chapter 6 ahead, under the section entitled 'International character set selection'.

You may now re-adjust the settings of DS1-1, DS1-2, DS1-3 (international characters) to suit your particular printing requirements.

(The functions of the remaining DIP switches (DS1-4 to DS1-8, and DS2-1 to DS2-8) are described in chapter 7 of this manual.)

# How to change to an alternative typeface

The LQ3500 is capable of reproducing many combinations of different print style, or 'typeface'.

Here's one to try out. Type in:

```
LPRINT CHR$(27) + "x" + CHR$(1)
LPRINT "This is LQ printing"
```

Look at the printing. If all went well, you should have selected the LQ (Letter Quality) typeface.

(If LQ printing hasn't been produced, check that you correctly typed in the above command, using a lower-case "x". If you can see the "x", you have the CHR$(27)+ bit wrong.)

To cancel the LQ setting, type in:

```
LPRINT CHR$(27) + "x" + CHR$(Ø)
LPRINT "this is standard printing"
```

To select and cancel the LQ setting, we have used what's known as a control code.

# What is a control code?

Good question. A control code is a special character used to call into action a function of the computer, while the code itself is not generally printed. CHR$(7) is a control code that makes the computer or the printer 'bleep'. Just try:

```
PRINT CHR$(7)
```

....or....

```
LPRINT CHR$(7)
```

Now take a look at the commands we used to select and cancel LQ printing. Notice that the first LPRINT statement had three parts (which were joined to each other by + plus signs). The three parts were:

1. CHR$(27)
2. "x"
3. CHR$(1) ....or.... CHR$(Ø)

Explanation:

**CHR$(27)** — The CHR$(27) part is known as an 'escape code' (often shortened to ESC), and tells the printer that what follows is NOT to be printed-out, but is to be used for enabling or disabling one of the printer's functions. A sequence of instructions starting with CHR$(27) is known as an 'escape sequence'.

**"x"** — The "x" part of the command is the individual code-letter appertaining to LQ operation. As you work through this guide, you will see that each particular printer function has its own code-letter.

**CHR$(1) ....or.... CHR$(Ø)** — The CHR$(1) or CHR$(Ø) part can be thought of as a switch to turn the particular function on or off. As you can see from the above examples, CHR$(1) switches the function *on;* CHR$(Ø) switches it *off.*

NOTE: In many of the examples that follow, the ASCII codes 'SOH' and 'NUL' are shown. These codes should be typed in as CHR$(1) and CHR$(Ø) respectively.

NOTE: A 'shorthand' means of combining escape code parameters such as "x" + CHR$(1) (shown in the previous example) is to simply type in "x1", ie. to select LQ, type:

```
LPRINT CHR$(27) + "x1"
```

....and to cancel LQ, type:

```
LPRINT CHR$(27) + "xØ"
```

Note that this shorthand technique does not work with all escape sequences. If you want to know whether it works with the sequence you are using, look it up in the relevant section.

# Chapter 3
# Selecting print styles....

Subjects covered in this chapter:

Choice of styles
Cancelling your choice
Combined styles
Illegal combinations

## Choice of style

The LQ3500 is capable of over 100 different print style combinations. There are five main typefaces, known as:

**Standard (sometimes known as 'Pica')**
**Mini (sometimes known as 'Elite')**
**Condensed**
**Proportional**
**LQ**

To these main typefaces, you may apply the following additional functions:

**Subscript**
**Superscript**
**Double-strike**
**Italics**
**Bold**

Finally, to any of the above combinations of typeface, you may apply:

**Underline**
**Double-width**

As you can see, there are lots of typefaces for you to choose from, and it's easy to get lost in a maze of combinations! It is perhaps worth remembering, therefore, that you can always get back to standard typeface (with no modifications) by switching the printer off, then on again.

The printer has a built-in memory of its own, so switching off your *computer* will NOT alter the printer's settings. Switching a PC off and on again will reset the printer, but this is an exception and most other computers don't do this.

## Selecting one of the main typefaces

Before we discuss all the different possible combinations of typeface and how to select them, let's start with the five main typefaces.

In each case, you will be shown the control code required to select or cancel the typeface, some explanation of what is going on, and an example command.

## Standard typeface

Standard typeface is automatically selected when the printer is first switched on, or when any combination of other typeface settings are cancelled. It is the one typeface that you do not have to explicitly *select*.

## Mini typeface

TO SELECT: ESC M

This means that the printer is now printing 12 CPI (characters per inch). Sometimes this is known as 'Elite pitch'.

Example command:

```
LPRINT CHR$(27) + "M"
LPRINT "this is mini typeface"
```

TO CANCEL: ESC P

This sequence tells the printer to print 10 CPI. This is sometimes known as 'Pica pitch'.

Example command:

```
LPRINT CHR$(27) + "P"
LPRINT "this is standard typeface again"
```

## Proportional typeface

TO SELECT: ESC p SOH

When the printer prints with a proportional typeface, it adjusts the distance between characters to something more aesthetically pleasing than a constant, say 1/10th of an inch. This stops characters such as 'l's looking 'stranded' and 'm's looking crushed together.

Another effect of this command is that it automatically switches the printer into LQ (Letter Quality) output, as this mode is the one usually used to print-out letters. It is not possible to print in proportionally spaced standard typeface.

Instead of NUL and SOH, "Ø" or "1" can be used.

Example command:

```
LPRINT CHR$(27) + "p" + CHR$(1)
LPRINT "this is the proportional typeface"
```

TO CANCEL: ESC p NUL

This is the proportional spacing being switched off. If LQ text was not switched on before the proportional typeface was started, then it will return to standard typeface again.

Example command:

```
LPRINT CHR$(27) + "p" + CHR$(Ø)
LPRINT "this is standard typeface again"
```

# Condensed typeface

TO SELECT: SI (or ESC SI)

This roughly doubles the number of characters packed into an inch. More precise figures are: 20 CPI when in Mini, and 17.14 CPI when in standard. It has no effect in LQ mode, or on downloaded characters.

Example command:

```
LPRINT CHR$(15)
LPRINT "this is condensed typeface"
```

TO CANCEL: DC2

This turns the condensed mode off again.

Example command:

```
LPRINT CHR$(18)
LPRINT "this is standard typeface again"
```

# LQ typeface

TO SELECT: ESC x SOH

This selects the printer's LQ (Letter Quality) mode, just as we did in the introduction. This is much slower than the draft mode, but the quality is much better. On the LQ3500, the print head only has to pass across the paper once to produce high-quality text, instead of 'building up' the text on successive passes.

Instead of NUL and SOH, "Ø" or "1" can be used.

Example command:

```
LPRINT CHR$(27) + "x" + CHR$(1)
LPRINT "this is LQ typeface"
```

NOTES: The LQ typeface may be manually selected by holding down the FF button while the printer is on line. The printer will bleep twice to indicate that LQ mode has been selected.

To select standard typeface again, hold down the LF button while the printer is on line. This time, the printer will bleep once to indicate that standard typeface has been re-selected.

Do not be surprised if some well-meaning word processor comes along and resets the printer after you have set it into LQ mode!

TO CANCEL: ESC x NUL

Example command:

```
LPRINT CHR$(27) + "x" + CHR$(Ø)
LPRINT "this is standard typeface again"
```

# Selecting additional functions

Having selected your main typeface, you may now modify it using the additional options available. Remember though, not all typestyles can be modified in every way.

# Subscript option

TO SELECT: ESC S SOH

This compacts the characters into the bottom half of the line, and is useful for producing such effects such as $H_2O$. For maximum effect, it is best to combine this with condensed text.

Turning on the subscript option automatically turns off the superscript option. Subscripted superscript doesn't really make sense, does it?

Instead of NUL and SOH, "Ø" or "1" can be used.

Example command:

```
LPRINT CHR$(27) + "S" + CHR$(1)
LPRINT "this is subscript option"
```

TO CANCEL: ESC T

This turns off the subscript text. It is also used to turn off the superscript text option (that comes next).

Example command:

```
LPRINT CHR$(27) + "T"
LPRINT "option cancelled"
```

# Superscript option

TO SELECT: ESC S NUL

This is like the subscript option, but compacts the characters into the top half of the line, and is useful for producing such effects such as $r^2$. For maximum effect, it is best to combine this with condensed text.

Example command:

```
LPRINT CHR$(27) + "S" + CHR$(Ø)
LPRINT "this is superscript option"
```

TO CANCEL: ESC T

This is exactly the same as cancelling the subscript option.

Example command:

```
LPRINT CHR$(27) + "T"
LPRINT "option cancelled"
```

# Double strike option

TO SELECT: ESC G

This makes the LQ3500 print any subsequent characters *twice* to make it appear bolder. Bit image graphics are not affected by this mode.

Example command:

```
LPRINT CHR$(27) + "G"
LPRINT "this is double strike option"
```

TO CANCEL: ESC H

This turns off double strike.

Example command:

```
LPRINT CHR$(27) + "H"
LPRINT "option cancelled"
```

# Italics option

TO SELECT: ESC 4

This makes all the characters lean slightly to the right. Very useful for *emphasising* things.

In Epson-type mode, this has much the same effect as the ESC > command. However, that method won't work in IBM-type mode (see the ESC t command for details on how to do that).

Example command:

```
LPRINT CHR$(27) + "4"
LPRINT "this is italics option"
```

TO CANCEL: ESC 5

This puts the italics text straight again. If the text was being forced into italic by the ESC > command, this command won't do the job; the ESC = command must be used.

Example command:

```
LPRINT CHR$(27) + "5"
LPRINT "option cancelled"
```

# Bold option

Sometimes known as 'emphasised' print. Like the double strike option, this prints any subsequent characters twice, however, the second time, they are printed slightly off-centre to produce a thicker looking character. Bit image graphics are not affected by this mode.

TO SELECT: ESC E

Example command:

```
LPRINT CHR$(27) + "E"
LPRINT "this is bold option"
```

TO CANCEL: ESC F

This turns off the bold option.

Example command:

```
LPRINT CHR$(27) + "F"
LPRINT "bold option cancelled"
```

# Selecting underline or double-width printing

Both underline and double-width printing may be added to any of the available combinations of typeface.

# Underline option

TO SELECT: ESC - SOH

This underlines all subsequent characters, the line being placed just underneath the lowest point of any character. The underline is actually drawn by a separate pass of the print head.

This command will not work during any bit image graphics mode, and is not affected by the double strike option.

Instead of NUL and SOH, "Ø" or "1" can be used.

Example command:

```
LPRINT CHR$(27) + "-" + CHR$(1)
LPRINT "this is underline option"
```

TO CANCEL: ESC - NUL

This turns off the underline option.

Example command:

```
LPRINT CHR$(27) + "-" + CHR$(Ø)
LPRINT "underline option cancelled"
```

## Double-width option (one line)

TO SELECT: SO

This, as its name suggests, makes all subsequently printed characters twice as wide as they normally are. It only lasts until the end of the line, so it will stop on: carriage return, line feed, vertical tab, form feed or a DC4 code. It is also cancelled when the text is too long and wraps round onto the next line.

Example command:

```
LPRINT CHR$(14)
LPRINT "this is double width option"
```

TO CANCEL: DC4

This is used when you want to turn off the double width option partway along the line.

Example command:

```
LPRINT CHR$(20)
LPRINT "option cancelled"
```

## Double-width option (continuous)

TO SELECT: ESC W SOH

Like the previous double width command, this makes all the subsequently printed characters twice as wide as they normally are. Unlike the previous command, however, this one lasts until the printer is reset or the cancel double width command (ESC W NUL) is used.

Instead of NUL and SOH, "0" or "1" can be used.

Example command:

```
LPRINT CHR$(27)+"W"+CHR$(1)
LPRINT "this is double width option"
```

TO CANCEL: ESC W NUL

This is used when you want to turn off the double width option which lasts for more than one line.

Example command:

```
LPRINT CHR$(27)+"W"+CHR$(0)
LPRINT "option cancelled"
```

# Combining styles

Now that you know how to access each of the different typefaces, you might like to combine a few of them.

Make sure that your printer is set to standard typeface with no additional style options selected - (if in doubt, switch the printer off, then on again).

Example command (using mini typeface with italics and underline):

```
LPRINT CHR$(27) + "M" + "You can emphasise a point using" +
CHR$(27) + "4" + " italics" + CHR$(27) + "5" + " or" +
CHR$(27) + "-" + CHR$(1) + " underline" + CHR$(27) + "-" +
CHR$(Ø) + CHR$(27) + "P"
```

Make sure that you type it all in as one line.

Note that each of the typefaces and options selected in this example are cancelled after use. If you don't cancel them, they will be used in the next print statement.

Studying the above example, you could be forgiven for thinking that it looks muddled, and that it is difficult to pick out your typeface selections.

A solution to this problem is to first assign the escape codes into string variables as follows:

```
ms$ = CHR$(27) + "M"                :REM (mini select)
mc$ = CHR$(27) + "P"                :REM (mini cancel)
is$ = CHR$(27) + "4"                :REM (italics select)
ic$ = CHR$(27) + "5"                :REM (italics cancel)
us$ = CHR$(27) + "-" + CHR$(1)      :REM (underline select)
uc$ = CHR$(27) + "-" + CHR$(Ø)      :REM (underline cancel)
```

....and thereafter use the string variables' names to select or cancel a particular typeface. Our above example then looks like this:

```
LPRINT ms$ + "You can emphasise a point using" + is$ +
"italics" + ic$ + " or" + us$ + " underline" + uc$ + mc$
```

Now that's much simpler, isn't it ?

In addition to this line, you could use the escape code variables in all subsequent print statements. It's a good idea to have a ready-written program or routine like this to call upon when you're printing in various styles; no doubt you'll incorporate something along these lines into your own text creation utility program.

If you want, you could even define a replacement for `CHR$(27)` as, say, e$. We do this in the next example.

So then, let's create the beginnings of such a program. We'll use the above escape code variables and add a few more typefaces and options as we go along. Furthermore, to save you repeatedly typing in CHR$(1) and CHR$(Ø), we have assigned these characters to the variables s$ and n$ respectively. Line numbers have also been added in case you wish to run the program more than once or save it. (Note that you need not type in the REM statements, they're just there to make the example clearer.)

```
10 REM printer control codes
20 e$ = CHR$(27)          : REM escape (ESC character)
30 s$ = CHR$(1)           : REM on (SOH character)
40 n$ = CHR$(Ø)           : REM off (NUL character)
50 ms$ = e$ + "M"         : REM (mini select)
60 mc$ = e$ + "P"         : REM (mini cancel)
70 is$ = e$ + "4"         : REM (italics select)
80 ic$ = e$ + "5"         : REM (italics cancel)
90 us$ = e$ + "-" + s$    : REM (underline select)
100 uc$ = e$ + "-" + n$   : REM (underline cancel)
110 ws$ = CHR$(14)        : REM (double width select)
120 wc$ = CHR$(20)        : REM (double width cancel)
130 cs$ = CHR$(15)        : REM (condensed select)
140 cc$ = CHR$(18)        : REM (condensed cancel)

RUN
```

Now try this example immediately after running the above program. Remember, this is all one line:

```
LPRINT ms$ + "You can emphasise a point using " + is$ +
"italics " + ic$ + "or " + us$ + "underline." + uc$ + "You
can also spread out a bit using " + ws$ + "double width
characters, " + wc$ + mc$ + cs$ + "or even hide something in
the small print! " + cc$
```

If you do this again, but in LQ mode, you will notice that the pitch changes and condensed print mode do not work. That is because these modes are an *illegal combination* (more about these at the end of this chapter).

# Subscripts and superscripts

Add the following to your escape code variables program:

```
150 lss$ = e$ + "x" + s$ : REM (LQ select)
160 lsc$ = e$ + "x" + n$ : REM (LQ cancel)
170 sbs$ = e$ + "S" + s$ : REM (subscript select)
180 sps$ = e$ + "S" + n$ : REM (superscript select)
190 ssc$ = e$ + "T"      : REM (subscript and superscript cancel)

RUN
```

(Note that the string variable ssc$ cancels *both* the subscript and superscript options.)

Example command (using LQ-standard typeface with subscripts and superscripts):

```
LPRINT lss$ + "Subscripts include H" + sbs$ + "2" + ssc$ +
"O and Log" + sbs$ + "10" + ssc$ + ", while superscripts
include 10" + sps$ + "-3" + ssc$ + " and 100" + sps$ + "o" +
ssc$ + "C." + lsc$
```

A few more assorted typefaces for your program:

```
200 ps$ = e$ + "p" + s$ : REM (proportional select)
210 pc$ = e$ + "p" + n$ : REM (proportional cancel)
220 ds$ = e$ + "G"      : REM (double strike select)
230 dc$ = e$ + "H"      : REM (double strike cancel)
240 bs$ = e$ + "E"      : REM (bold select)
250 bc$ = e$ + "F"      : REM (bold cancel)

RUN
```

Example commands (using proportional, double strike, italics, and bold typefaces):

```
LPRINT ps$ + "Liberal supporters will favour the
       proportional representation of their print-out" + pc$
LPRINT "Trade unionists will vote for the " + ds$ + "double
       strike " + dc$ + "option"
LPRINT "Journalists will probably take a " + is$ + "slanted"
        ic$ + " view"
LPRINT "Your mission: " + bs$ + "to boldly print like no
       other printer" + bc$
```

In addition to the individual commands shown in this chapter, you may also select from a limited range of typeface combinations using the single escape code ESC ! ‹n›. This code is described in chapter 6 under the section entitled 'Print mode selection'.

# Illegal combinations -what you can and can't do

All print styles will support underlining, double width, double strike, emphasised print, superscript, subscript and italics.

Selecting proportional spacing mode automatically sets LQ mode, and inherits all its restrictions.

LQ is always in either standard pitch or proportional spacing, double width is supported, but not condensed.

# Chapter 4
# Print formatting control....

Subjects covered in this chapter:

Print head movement
Form feed
Margin setting
Page length setting
Perforation skipping
Tabulation
Text justification
Paper feed rate adjustment
Inter-character spacing

NOTE: If, in the examples ahead, you wish to follow a control code by your own further printer instructions, then you should terminate the code with a semicolon to suppress the carriage return/line feed which will otherwise be automatically sent after the code.

## Carriage return

This code sends the print head back to the beginning of the line, ready to start printing at the left-hand margin. If DS2-2 is set on, the printer automatically follows this code with a line feed.

TO SELECT: CR

Example command:

```
LPRINT CHR$(13)
```

Note: This command and line feed (below) both cancel the double width print mode set by the SO code.

## Line feed

This code feeds the paper up by one line so that the print head is ready to start printing on the next line. Line feed has the additional effect of outputting the contents of the buffer.

TO SELECT: LF

Example command:

```
LPRINT CHR$(10)
```

## Backspace

This code moves the print head one space to the left.

TO SELECT: BS

Example command:

```
LPRINT CHR$(8)
```

Note that backspace will not operate under the following circumstances:

1. When in centre, right and full justification modes.
2. Immediately after graphics printing.
3. At the left margin.
4. Past a point where the print mode was changed.
5. After a horizontal positioning command or HT code

## Form feed

This code moves the print head to the start of the next page. It can be thought of as 'start a new page'. Form feed is always accompanied by a carriage return.

TO SELECT: FF

Example command:

```
LPRINT CHR$(12)
```

## Print head positioning

The print head can also be moved in a more advanced manner to an exact location on the line. This is done with an accuracy of 1/60 inch and starts from the current left margin.

TO SELECT: ESC $ ‹n1› ‹n2›

Here, ‹n1› is between 0 and 255; ‹n2› is between 0 and 3. The number of 1/60 inch units moved is: (‹n2›*256+‹n1›).

It can also be moved to an exact position from where it is already. This is also done with an accuracy of 1/60 inch.

Example command:

```
LPRINT "This is about" + CHR$(27) + "$" + CHR$(3Ø) +
       CHR$(Ø) + "half an inch"
```

TO SELECT: ESC \ ‹n1› ‹n2›

This moves the print head on (‹n2›*256)+‹n1› 'dots'. A 'dot' varies from 1/120 inch in standard or mini, to 1/180 inch in LQ, to 1/240 inch in condensed.

Example command:

```
LPRINT "This is about" + CHR$(27) + "\" + CHR$(6Ø) +
       CHR$(Ø) + "half an inch"
```

# Margins

The width of the page can be set by altering the margins outside of which the printer will not print:

# Left margin setting

This code sets the left hand margin to the value of ‹n› (in the range 0 to 255). The value ‹n› represents the number of character columns from the left hand edge of the printer.

TO SELECT: ESC l ‹n›

Example command:

```
LPRINT CHR$(27) + "l" + CHR$(2Ø)
```

# Right margin setting

This code sets the right hand margin to the value of ‹n› (in the range 1 to 255). The value ‹n› represents the number of character columns from the *left* hand edge of the printer.

TO SELECT: ESC Q ‹n›

Example command:

```
LPRINT CHR$(27) + "Q" + CHR$(50)
```

Note that if the right hand margin is set to a value which is less than (or equal to) the left hand margin, then the right hand margin setting will be ignored.

# Page length setting (by lines)

This code sets the page length to the value of ‹n› (in the range 1 to 127). The value ‹n› represents the number of lines per page. Note that changing the paper feed setting (described ahead) will not alter the page length.

TO SELECT: ESC C ‹n›

Example command:

```
LPRINT CHR$(27) + "C" + CHR$(15)
```

# Page length setting (by inches)

This code sets the page length to the value of ‹n› (in the range 1 to 22). The value ‹n› represents the number of inches per page.

TO SELECT: ESC C NUL ‹n›

Example command:

```
LPRINT CHR$(27) + "C" + CHR$(0) + CHR$(4)
```

# Skip perforation setting

When using continuous stationery (such as fan fold/tractor feed paper) the printer can be set to skip a number of lines when it reaches the foot of a page in order to avoid printing directly over the perforations in the paper.

This code sets skip perforation to the value of ‹n› (in the range 1 to 127). The value ‹n› represents the number of lines to be skipped at the foot of a page. This value is deducted from the page length setting (in lines or inches) if previously set.

TO SELECT: ESC N ‹n›

Example command:

```
LPRINT CHR$(27) + "N" + CHR$(5)
```

TO CANCEL: ESC 0 (note that this is the *capital letter* 0)

Example command:

```
LPRINT CHR$(27) + "O"
```

# Tabulation

It is possible to set up variable positions to which the print head can be moved. These are called tabulation settings or 'tabs' for short. Tabs can be set for vertical and horizontal positions. Once the tab positions have been set, the print head is sent to that position by the appropriate tab jump command.

The LQ3500 has an additional feature allowing vertical tabs to be set in different *channels*. A channel can then be selected and the tab settings for that channel used.

# Horizontal tab setting

This code sets the horizontal tab positions. Up to 32 tab positions may be specified (each in the range 1 to 137).

TO SELECT: ESC D ‹n1› ‹n2› ‹n3› ....etc.... ‹n32› NUL

The value of ‹n2› should be greater than the value of ‹n1›, ‹n3› should be greater than ‹n2›, ‹n4› should be greater than ‹n3›, and so on. The sequence of tab numbers must be terminated by CHR$(Ø).

(When the printer is first switched on, horizontal tabs default to every 8 character positions.)

Example command:

```
LPRINT CHR$(27) + "D" + CHR$(1Ø) + CHR$(2Ø) + CHR$(Ø)
```

# Horizontal tab jump

This code sends the print head to the next horizontal tab position. It is ignored when more tabs have been sent than tab stops and in centre, right or full justification.

TO SELECT: HT

Example command:

```
LPRINT CHR$(9)
```

# Vertical tab setting

This code sets the vertical tab positions. Up to 16 tab positions may be specified (each in the range 1 to 254).

TO SELECT: ESC B ‹n1› ‹n2› ‹n3› ....etc.... ‹n16› NUL

The value of ‹n2› should be greater than the value of ‹n1›, ‹n3› should be greater than ‹n2›, ‹n4› should be greater than ‹n3›, and so on. The sequence of tab numbers must be terminated by `CHR$(Ø)`.

(When the printer is first switched on, vertical tabs default to single line feeds.)

Example command:

```
LPRINT CHR$(27) + "B" + CHR$(1Ø) + CHR$(2Ø) + CHR$(Ø)
```

# Vertical tab jump

This code sends the print head to the next vertical tab position.

Example command:

```
LPRINT CHR$(11)
```

# Tab channel setting

There are eight channels for which it is possible to set up to 16 vertical tab positions each. This feature is intended for applications where more than one type of page format is being used within a document. To use this feature, you should first set up the channel and tab settings (using ESC b ‹channel› ‹n1› ....etc.... NUL) for each of the required channels. You may thereafter select the appropriate channel (using ESC / ‹channel›) when you wish to call up a new set of tabs, and use the vertical tab jump (VT) code to move to the next tab position.

NOTE: If no channel tabs are set up or selected, channel 0iis assumed.

TO SELECT: ESC b ‹channel› ‹n1› ‹n2› ‹n3› ....etc.... ‹n16› NUL

The ‹channel› parameter must be in the range 0 to 7.

The value of ‹n2› should be greater than the value of ‹n1›, ‹n3› should be greater than ‹n2›, ‹n4› should be greater than ‹n3›, and so on. The sequence of tab numbers must be terminated by CHR$(Ø).

Example command:

```
LPRINT CHR$(27) + "b" + CHR$(7) + CHR$(1Ø) + CHR$(2Ø) +
       CHR$(Ø)
```

# Channel selection

This code selects the tab channel to be used (in the range 0 to 7).

TO SELECT: ESC / ‹channel›

Example command:

```
LPRINT CHR$(27) + "/" + CHR$(7)
```

All subsequent vertical tab jump (VT) codes will move the print head to the next vertical tab position for that particular channel.

# Text justification

Text can be automatically justified by the printer. The text can be made to fit to the left-hand side, the right-hand side, in the centre or to both margins (fully justified). This can greatly simplify word processing.

TO SELECT: ESC a ‹n›

Where:

| ‹n› | Justification |
|---|---|
| 0 | Left |
| 1 | Centre |
| 2 | Right |
| 3 | Full |

Example commands:

```
LPRINT CHR$(27)+ "a" +CHR$(Ø)
LPRINT "left justified text"

LPRINT CHR$(27)+ "a" +CHR$(1)
LPRINT "this is centered"
```

```
LPRINT CHR$(27)+ "a" +CHR$(2)
LPRINT "now to the right"
LPRINT CHR$(27)+ "a" +CHR$(3)
LPRINT "if this text goes on long enough, it will end
up perfectly justified at both margins (one hopes).
Add some more to it if it doesn't quite reach."
```

# Paper feed rates

When the printer is switched on, the paper feed rate defaults to $^1/_6$ inch per line. However, the amount of paper fed per line can be altered using the following commands:

## $^1/_8$ inch paper feed

TO SELECT: ESC Ø (note that this is the *number* Ø)

Example command:

```
LPRINT CHR$(27) + "Ø"
```

## $^1/_6$ inch paper feed (default)

TO SELECT: ESC 2

Example command:

```
LPRINT CHR$(27) + "2"
```

## Variable $^{\langle n \rangle}/_{180}$ inch paper feed

This code sets the paper feed rate to ‹n›/180 inch. The value of ‹n› may be in the range 0 to 255.

TO SELECT: ESC 3 ‹n›

Example command:

```
LPRINT CHR$(27) + "3" + CHR$(27)
```

## Variable ‹n›/60 inch paper feed

This code sets the paper feed rate to ‹n›/60 inch. The value of ‹n› may be in the range 0 to 85.

TO SELECT: ESC A ‹n›

Example command:

```
LPRINT CHR$(27) + "A" + CHR$(18)
```

## Variable ‹n›/180 inch one-shot forward feed

This code executes a once-only forward paper feed of ‹n›/180 inch. The value of ‹n› may be in the range 0 to 255.

TO SELECT: ESC J ‹n›

Example command:

```
LPRINT CHR$(27) + "J" + CHR$(216)
```

## Variable ‹n›/180 inch one-shot reverse feed

This code executes a once-only reverse paper feed of ‹n›/180 inch. The value of ‹n› may be in the range 0 to 255.

TO SELECT: ESC j ‹n›

Example command:

```
LPRINT CHR$(27) + "j" + CHR$(108)
```

WARNING: Do not attempt a reverse paper feed while printing within the top 30mm or the bottom 80mm of the paper, (or within 30mm of the perforations on tractor feed paper).

## Inter-character spacing

This advances the print head a specified number of 'dots' to the right after each character is printed. The exact size of a 'dot' varies from 1/120 inch in standard or mini, to 1/180 inch in LQ, and 1/240 inch in condensed mode. Printing in double width will double the size of a dot.

Setting the parameter ‹n› to zero will put things back to normal.

TO SELECT: ESC SPC ‹n›

Example command:

```
LPRINT CHR$(27) + " " + CHR$(30) + "Spot the spacing..."
```

# Chapter 5
# Graphics printing....

Subjects covered in this chapter:

Introduction
Single, double, triple, and quadruple density graphics
Bit image graphics modes
Graphics character alignment

## What is graphics printing?

In contrast to normal character printing mode, the LQ3500 offers what's known as 'graphics mode'. When set to this mode, the printer has a different way of interpreting the data it receives; instead of a character being printed *as is*, the data is used to directly control each of the tiny individual 'pins' inside the print head. For each item (byte) of data received, only one line of dots is drawn vertically. Whether or not a dot is drawn depends upon the byte of data sent. Each bit in the byte can be a 1 or a 0; a 1 indicates that a dot should be printed, a 0 indicates that a space should be left. This is known as 'bit image graphics'.

In graphics mode, control codes are also printed as bit image graphics (rather than being executed). This means that the effect of sending, for example, a carriage return or line feed will NOT be to execute the appropriate function, but to actually print-out a series of dots on the paper. Moreover, the graphics mode does NOT itself execute a carriage return and line feed automatically when it reaches the end of a line.

The graphics mode is entered using an escape code. Two further parameters are also included and these tell the printer how much data it should turn into dot graphics before reverting to normal character printing mode (in order to execute a carriage return, line feed, etc.). These parameters are known as ‹n1› and ‹n2›. The ‹n2› parameter represents the number of whole 256-dot portions to be printed, while the ‹n1› parameter represents the remainder of individual dots. The parameter ‹n1› should be in the range 0 to 255, and ‹n2› in 0 to 127.

Hence, for example, if you were specifying a code to produce a graphics dump of a screen image 640 pixels wide, the parameter ‹n2› would be set to 2 (as there are 2 x 256 in 640), while ‹n1› would be set to 128 (the remainder). Such an example command may look like this:

```
LPRINT CHR$(27) + "L" + CHR$(128) + CHR$(2)
```

To calculate the values for ‹n1› and ‹n2›, you may use the following program:

```
10 INPUT "number of dots";d
20 PRINT "<n1> =";  d MOD 256
30 PRINT "<n2> =";  INT(d/256)

RUN
```

There is a maximum number of dots that can be printed on one line. If the maximum number is exceeded, then the additional data is ignored.

Type in the following example program:

```
10 WIDTH LPRINT 255
20 LPRINT CHR$(27) + "K" + CHR$(126) + CHR$(0);
30 FOR n=1 TO 126
40     LPRINT CHR$(87);
50 NEXT

RUN
```

There are a few points that should be noted about this program:

Firstly, a `WIDTH LPRINT 255` command has been included. This suppresses the automatic generation of carriage return/line feed after a certain number of characters are printed-out. If carriage return/line feed were not suppressed, spurious dot patterns in the printed output graphics would result.

Secondly, the use of a semicolon to terminate the print statement (in line 20) which selects graphics mode is essential, as this suppresses the carriage return/line feed normally executed after a print statement, which again would otherwise result in spurious dot patterns.

We have used 87 as our data in line 40 of the above example. This corresponds to the 8-bit binary number 01010111. Looking at the number in binary form you can see the effect of each 1 and 0 on the result.

The following diagram illustrates how each bit of data relates to a corresponding pin on the print head, which in turn produces a corresponding dot on the paper.

**TOP**

o Group 1
o
o
o
o
o
o
o

o Group 2
o
o
o
o
o
o
o

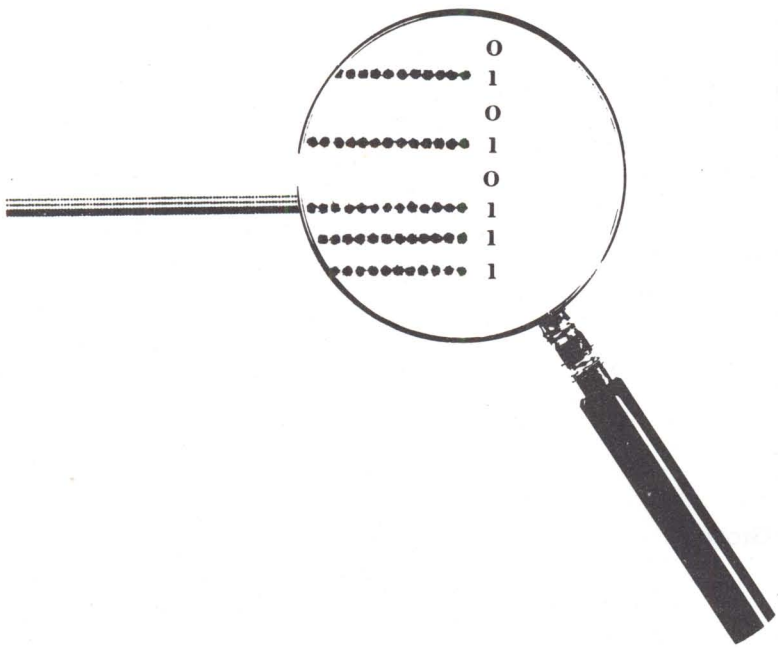
o Group 3
o
o
o
o
o
o
o

**PRINT HEAD**

As there are 24 pins, when in an 8-bit mode, every third pin is fired. The print-out will look a little faint, however, if all pins were fired simultaneously, this would rapidly cause overheating of the print head.

When in 24-bit mode, the first packet of 8 bits fires the first 8 pins, the next packet the second, and the next the third. Further data would start the process over again. This mode should not be used to print solid background for too long a time, or the print head will overheat.

In the above example program, therefore, the 8-bit graphics mode is selected in line 20, then the FOR....NEXT loop (lines 30 to 50) prints-out the binary data 01010111 as a column of dots downwards, 126 times along the paper. The result should look like this:




Try experimenting with different numbers in line 40 of the above example program to make sure that you understand the bit-to-dot correspondence.

# Graphics modes

There is more than one graphics mode. Each of the modes (summarised below) offer differing combinations of density and speed.

# Single density graphics

(Maximum printable positions on a line - 480)

TO SELECT: ESC K ‹n1› ‹n2›

## Double density graphics

(Maximum printable positions on a line - 960)

TO SELECT: ESC L ‹n1› ‹n2›

## Double speed double density graphics

(Maximum printable positions on a line - 960)

TO SELECT: ESC Y ‹n1› ‹n2›

## Quadruple density graphics

(Maximum printable positions on a line - 1920)

TO SELECT: ESC Z ‹n1› ‹n2›

## Bit image mode

TO SELECT: ESC * ‹mode› ‹n1› ‹n2›

....where the ‹mode› parameter is the required graphics mode (see the following table):

| ‹mode› 8-Pin | 24-pin | Number of dots/8 inch | Connecting dot density/8 inch | Head speed (inch/sec) |
|---|---|---|---|---|
| 0 | 32 | 480 single density | 480 | 10.5 |
| 1 | 33 | 960 double density | 960 | 5.25 |
| 2 | -- | 960 double speed/double density | 480 | 10.5 |
| 3 | -- | 1920 quadruple density | 960 | 5.25 |
| 4 | -- | 640 CRT graphic | 640 | 5.25 |
| 6 | 38 | 720 CRT graphic | 720 | 5.25 |
| -- | 39 | 2448 triple-density | 1440 | 5.25 |

‹n1› must be in the range 0 to 255, ‹n2› in 0 to 127.

## Bit image mode selection/change

TO SELECT: ESC ? ‹code› ‹mode›

....where the ‹code› parameter is one of the escape code letters K, L, Y, or Z (described earlier in this chapter), and where the ‹mode› parameter is in the ranges previously described for the ESC * code.

## Graphics character alignment

NOTE: When printing-out graphics characters or boxes whose vertical lines are to be continuous down the page (or when using ready-made graphics characters from IBM character sets #1 and #2), you should additionally select the code for uni-directional printing (ESC U SOH) described in chapter 6 ahead. This will afford more accurate alignment of the vertical lines.

# Chapter 6
# Extra functions....

Subjects covered in this chapter:

- Printer enable/disable
- Repeating print
- Eighth bit setting
- Reset, paper out, bell, and delete
- Print head control
- Character table selection
- International character sets
- Print mode selection
- User defined characters
- Hexadecimal dump

## Printer disable

This code tells the printer to ignore anything that is sent to it from then on (except the printer enable command). Sending this code in the middle of graphics commands, or as a command parameter, will not disable the printer.

This code, and the following printer enable code, only work when DS1-8 is set to *on*.

TO SELECT: DC1

Example command:

```
LPRINT CHR$(17)
```

TO CANCEL: DC3

Example command:

```
LPRINT CHR$(19)
```

## Repeating print

This allows a group of characters or control codes to be printed many times without 'tying up' your computer. Any codes (except another repeating print code) can be used, as long as it all fits into the data buffer.

TO SELECT: ESC V ‹n› ‹data› ESC V NUL

Example command:

```
LPRINT CHR$(27) + "V" + CHR$(100)
LPRINT "I must not cheat on my lines."
LPRINT CHR$(27) + "V" + CHR$(0)
```

## Set eighth bit

This code sets the eighth bit of every code sent to the printer to 1. In Epson mode, this causes the characters to go into italics.

TO SELECT: ESC >

Example command:

```
LPRINT CHR$(27) + ">"
```

## Unset eighth bit

This code sets the eighth bit of every code sent to the printer to 0.

TO SELECT: ESC =

Example command:

```
LPRINT CHR$(27) + "="
```

## Accept eighth bit

This code cancels the above (set and unset) commands, directing the printer to accept all eight bits as they are received from the computer.

TO SELECT: ESC #

Example command:

```
LPRINT CHR$(27) + "#"
```

## Reset printer

This code resets the printer. The printer will then perform as if it had just been switched on.

TO SELECT: ESC @

Example command:

```
LPRINT CHR$(27) + "@"
```

## Paper out sensor disable

This code disables the action of the paper out sensor which halts the printer when there is no paper.

TO SELECT: ESC 8

Example command:

```
LPRINT CHR$(27) + "8"
```

## Paper out sensor enable

This code re-enables the action of the paper out sensor.

TO SELECT: ESC 9

Example command:

```
LPRINT CHR$(27) + "9"
```

## Bell

This code sounds the printer's internal bleeper. If the DIP switch DS1-6 is set to on, then no bleep will be produced.

TO SELECT: BEL

Example command:

```
LPRINT CHR$(7)
```

## Delete

This code removes the last character from the printer's buffer.

TO SELECT: DEL

Example command:

```
LPRINT CHR$(127)
```

Note that the above code will not delete any *control codes* in the buffer.

## Uni-directional printing

By default, the LQ3500 prints in both directions - left to right and right to left. This code selects printing from left to right only.

TO SELECT: ESC U SOH

Instead of NUL and SOH, "Ø" or "1" can be used.

Example command:

```
LPRINT CHR$(27) + "U" + CHR$(1)
```

TO CANCEL: ESC U NUL

Example command:

```
LPRINT CHR$(27) + "U" + CHR$(Ø)
```

NOTE: When printing-out graphics characters or boxes whose vertical lines are to be continuous down the page (or when using ready-made graphics characters from IBM character sets #1 and #2), you should additionally select uni-directional printing. This will afford more accurate alignment of the vertical lines.

## Left to right printing

This code prints the current line only from left to right.

TO SELECT: ESC <

Example command:

```
LPRINT CHR$(27) + "<"
LPRINT "This will always print left to right"
```

## Half speed

This code halves the speed of the print head's movement.

TO SELECT: ESC s SOH

Instead of NUL and SOH, "Ø" or "1" can be used.

Example command:

```
LPRINT CHR$(27) + "s" + CHR$(1)
```

TO CANCEL: ESC s NUL

Example command:

```
LPRINT CHR$(27) + "s" + CHR$(Ø)
```

## Character table selection

The setting of DIP switch DS2-5 selects the default character set to be used when the printer is switched on. The following code allow the DIP switch setting to be overridden or enhanced by software.

TO SELECT: ESC t ‹n›

Where ‹n› can take the following values:

| ‹n› | Character Set |
|---|---|
| 0 | Epson |
| 1 | IBM #1 |
| 2 | IBM #2 |

Example command:

```
LPRINT CHR$(27) + "t" + CHR$(1)
```

The following example program uses the above code and selects LQ typeface in order to print-out characters from table 4.2 (see appendix 2).

```
1Ø LPRINT CHR$(27) + "t" + CHR$(2)
2Ø LPRINT CHR$(27) + "x" + CHR$(1)
3Ø FOR c=3 TO 6
4Ø     LPRINT CHR$(c)
5Ø NEXT

RUN
```

## Selecting IBM character sets

When in IBM mode, either of the IBM character sets can be selected with the following commands:

## IBM character set #2

TO SELECT: ESC 6

Example command:

```
LPRINT CHR$(27) + "6"
```

## IBM character set #1

TO SELECT: ESC 7

Example command:

```
LPRINT CHR$(27) + "7"
```

For details of character sets, see appendix 2.

## International character set selection

The setting of DIP switches DS1-1, DS1-2 and DS1-3 (described in chapter 2) facilitates hardware selection of the international characters to be used when the printer is switched on. The following code allows the DIP switch settings to be overridden by software.

TO SELECT: ESC R ‹n›

....where ‹n› is in the range 0 to 10 for the following countries:

| ‹n› | COUNTRY |
|---|---|
| 0 | USA |
| 1 | France I |
| 2 | Germany |
| 3 | UK I |
| 4 | Denmark I |
| 5 | Sweden |
| 6 | Italy |
| 7 | Spain |
| 8 | Japan |
| 9 | Norway |
| 10 | Denmark II |

Example command:

```
LPRINT CHR$(27) + "R" + CHR$(3)
```

The following example program prints-out (for each of the above countries - 0 to 10) the character numbers listed in line 90.

```
10 FOR n=0 TO 10
20    RESTORE 90
30    LPRINT CHR$(27) + "R" + CHR$(n)
40    FOR c=1 TO 12
50       READ d
60       LPRINT SPC(4); CHR$(d);
70    NEXT
80 NEXT
90 DATA 35,36,64,91,92,93,94,96,123,124,125,126

RUN
```

IMPORTANT: To print international characters, IBM character set #1 or #2 must NOT be selected - ie. DIP switch DS2-5 must be *off*.

# Print mode selection

This code enables you to select a combination of some of the more commonly used typefaces and options, namely: standard, mini, condensed, bold, double strike and double width.

TO SELECT: ESC ! ‹n›

Example command:

```
LPRINT CHR$(27) + "!" + CHR$(17)
```

....where ‹n› is a bit-significant number selecting the typeface and option as follows:

| | |
|---|---|
| Standard typeface | - set the value of ‹n› to 0 |
| Mini typeface | - add 1 to the value of ‹n› |
| Proportional option | - add 2 to the value of ‹n› |
| Condensed typeface | - add 4 to the value of ‹n› |
| Bold option | - add 8 to the value of ‹n› |
| Double strike option | - add 16 to the value of ‹n› |
| Double width option | - add 32 to the value of ‹n› |
| Italics option | - add 64 to the value of ‹n› |
| Underline | - add 128 to the value of ‹n› |

Thus, setting the value of ‹n› to 17 (as in the above example command) selects mini typeface (add 1) with the double strike option (add 16), ie. 1 + 16 = 17.

Remember that illegal combinations of typeface and option must be avoided when choosing the value of ‹n›. See the notes at the end of chapter 3.

NOTE: Take care when setting ‹n› to 9. Some BASICs change this to a string of spaces. Check your BASIC manual.

TO CANCEL: ESC ! NUL

Example command:

```
LPRINT CHR$(27) + "!" + CHR$(Ø)
```

# User defined characters

The LQ3500 has the ability to print user defined characters. The following section outlines how to to go about defining (downloading) a character.

There are three main stages to go through before a downloaded character appears on the paper:

1. Download character definition
2. Download character set selection
3. Printing of the character

# 1. Download character definition

TO SELECT: ESC & NUL ‹first› ‹last› ‹left› ‹body› ‹right› ‹d1› ‹d2› ....etc.... ‹d(n)›
‹left› ‹body› ‹right› ‹d1› ‹d2› ....etc.... ‹d(n)›
‹left› ‹body› ‹right› ‹d1› ‹d2› ....etc.... ‹d(n)›
‹left› ‹body› ‹right› ‹d1› ‹d2› ....etc.... ‹d(n)›
‹left› ‹body› ‹right› ‹d1› ‹d2› ....etc.... ‹d(n)›
....etc....

Example command:

```
LPRINT CHR$(27) + "&" + CHR$(Ø) +
       CHR$(126) + CHR$(126) + CHR$(11)
```

It is possible to define any of the characters in the range 0 to 127, though some of these cannot be displayed (as the control codes take precedence).

The ‹first› and ‹last› parameters specify the range of character numbers which are to be defined. The parameter ‹first› should be less than (or equal to) ‹last›. If ‹first› is less than ‹last›, then the data for the additional characters (‹left› ‹body› ‹right› ‹d1› .... ‹d(n)›) should be added onto the statement.

The ‹left› and ‹right› parameters are the number of dots that are put to the left and right of the defined character. If you don't want any additional spacing, then use nulls.

The parameters ‹d1› to ‹d(n)› are the bit significant data for the vertical line of dots. Each line consists of three sets of dots like this:

‹d1› ‹d4› ‹d7› ‹d10› .....

(MSB) bit 7
bit 6
bit 5
bit 4
bit 3
bit 2
bit 1
(LSB) bit 0

‹d2› ‹d5› ‹d8› ‹d11› .....

(MSB) bit 7
bit 6
bit 5
bit 4
bit 3
bit 2
bit 1
(LSB) bit 0

‹d3› ‹d6› ‹d9› ‹d12› .....

(MSB) bit 7
bit 6
bit 5
bit 4
bit 3
bit 2
bit 1
(LSB) bit 0

Note that (n) must, therefore, be a multiple of three.

The character is defined from left to right with the highest bit printed at the top of the character. Note that the printer is incapable of printing contiguous dots on the same horizontal line, and every other horizontally adjacent bit will be ignored if this is attempted. This will become clearer if you study the example at the end of this section.

Characters are defined in the mode that the printer is in when you download a character.

# 2. Download character set selection

TO SELECT: ESC % SOH

Example command:

```
LPRINT CHR$(27) + "%" + CHR$(1)
```

The above code selects the download character set for use.

TO CANCEL: ESC % NUL

Example command:

```
LPRINT CHR$(27) + "%" + CHR$(Ø)
```

The above code de-selects the download character set and re-selects the internal character set.

For your reference, the following code copies the internal character set into the download set. This is a good way of wiping out the redefined set for a clean start:

TO SELECT: ESC : NUL NUL NUL

Example command:

```
LPRINT CHR$(27) + ":" + CHR$(Ø) + CHR$(Ø) CHR$(Ø)
```

Note that when the printer is switched on, the download set is undefined.

# 3. Printing of the character

Simply send the download character to the printer.

Example program:

The following program uses the above sequence of operations to create a user defined character (a square box). The box is three characters-worth of data deep, ie. the left hand side requires three characters to be sent for it. The first set of three characters are the left hand side, the next nine groups of three are the centre (top and bottom sides), and the last group of three are the right hand side.

(NOTE: If you intend to type in this program, you need not bother including the REM statements.)

```
10 WIDTH LPRINT 255
20 REM download character set selection
30 LPRINT CHR$(27) + "&" + CHR$(Ø) + CHR$(126) + CHR$(126)
   + CHR$(Ø) + CHR$(11) + CHR$(2);
40 :
50 REM this is the left side of the box
60 LPRINT CHR$(255) + CHR$(255) + CHR$(255);
70 :
80 REM top and bottom of box90 FOR i=1 TO 9
100 LPRINT CHR$(128) + CHR$(Ø) + CHR$(1);
110 NEXT i
120 :
```

program continued...

```
130 REM right side of box
140 LPRINT CHR$(255) + CHR$(255) + CHR$(255);
150 :
160 LPRINT CHR$(27) + "%" + CHR$(1): REM enable downloaded set
170 :
180 REM print-out the finished download character (40 times)
190 FOR p=1 TO 40
200 LPRINT CHR$(126);
210 NEXT
220 LPRINT

RUN
```

The program will produce the following results:

NOTE: For this example program to work, DIP switch DS2-4 must be set to the *on* position. (See chapter 7 for a table of all DIP switch functions.)

REMEMBER: Always switch the printer *off* before adjusting the DIP switches.

# Hexadecimal dump

The LQ3500 has the ability to automatically print-out, in hexadecimal format, the value of each byte of data it receives. To select this mode, the printer must be switched *on* while the LF and FF buttons are held down together.

To illustrate this facility, load a piece of paper into the printer, switch the printer *off*, then hold down the LF and FF buttons together while switching the printer *on* again. The printer is now in the hex dump mode.

Start up BASIC on your PC and type:

```
10 REM abcdef123
```

Now list this one-line program to the printer by typing:

```
LLIST
```

You should see the following hex codes printed out:

```
31 30 20 52 45 4D 20 61 62 63 64 65 66 31 32 33     10 REM abcdef123
0D 0A
```

....which are the ASCII codes (in hex) for the characters in the program you listed (including the line number and spaces) plus carriage return and line feed (0D and 0A).

At the right-hand side of the hex codes, the characters are printed in ASCII (as faithfully as possible).

In the hex dump mode, there will usually be some characters left in the buffer after printing. Therefore, when the printer has stopped, always set it off line to flush the buffer.

To cancel the hex dump mode, simply switch the printer *off*.

# Chapter 7
# For your reference....

Subjects covered in this chapter:

Technical Specification
Printer socket
Interface
DIP switch functions
Signal timing
If your printer stops printing

## Technical Specification

**Print system:**
Impact dot-matrix

**Print speed:**

| | |
|---|---|
| Standard typeface | 12 CPI / 160 CPS |
| | 10 CPI / 135 CPS |
| Condensed | 12 CPI / 74 CPS |
| | 10 CPI / 62 CPS |
| LQ | 12 CPI / 54 CPS |
| | 10 CPI / 45 CPS |

**Printing characteristics:**
24-pin print head, capable of 8-pin emulation
96 characters ASCII and italics
International character sets
Graphics character set

**Normal character size:**
2.1 (width) x 2.55 (height) mm

**Print sizes:**
ltandard (Pica) - 10 CPI / 80 CPL
Mini (Elite) - 12 CPI / 96 CPL
Condensed - 17 CPI / 137 CPL
Double width standard - 5 CPI / 40 CPL
Double width mini - 6 CPI / 48 CPL
Double width condensed - 8.5 CPI / 68 CPL

**Number of columns:**

80 (standard)
40 (double width)
132 (condensed)
66 (double width condensed)

**Line feed rates:**

1/6 inch
1/8 inch
‹n›/180 inch programmable
‹n›/60 inch programmable

**Line feed speed:**

200 mS (1/6 inch)

**Paper type:**

4.5 to 10 inches fan-fold (tractor feed)
4 to 9.5 inches cut sheet or roll paper (friction feed)

**Number of copies:**

1 sheets (incl. original)
40 $g/m^2$ pressure-sensitive paper train

**Interface:**

Parallel (Centronics compatible)

**Buffer Size:**

7K bytes.

**Mains supply:**

220-240 Volt AC 50 Hz

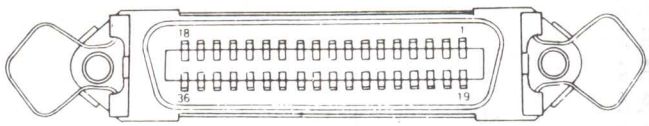
**Dimensions:**

17.5 (width) x 16 (depth) x 4 (height) inches
(440 x 400 x 100 mm)

**Weight:**

5.9 kg

# Printer socket




**Rear view of printer**

# Interface

| PIN | DESIGNATION | I/O | DESCRIPTION |
|---|---|---|---|
| 1 | $\overline{\text{STROBE}}$ | IN | Taking pin low enables receiving of DATA 0 to DATA 7. Minimum necessary pulse width is 0.5$\mu$S. |
| 2 | DATA 0 (LSB) | IN | 8-bit data signal. Taking pin high or low corresponds to 1 and 0 respectively. |
| 3 | DATA 1 | | |
| 4 | DATA 2 | | |
| 5 | DATA 3 | | |
| 6 | DATA 4 | | |
| 7 | DATA 5 | | |
| 8 | DATA 6 | | |
| 9 | DATA 7 (MSB) | | |
| 10 | $\overline{\text{ACKNOWLEDGE}}$ | OUT | Active low output pulse generated when data entry and processing are completed. After this signal, subsequent data will be accepted. This signal is also generated when changing from off line to on line. |
| 11 | BUSY | OUT | Output high under any of the following conditions:<br>a. Going off line.<br>b. Paper feed or printing operation.<br>c. When a control code is received. |
| 12 | PE | OUT | Output high when paper is out. (When on line, paper out is sensed after executing the paper feed command. When off line, paper out is always sensed.) |
| 13 | SELECT | OUT | On line and off line correspond to high and low respectively. When off line, DATA 0 to DATA 7 cannot be received. |
| 14 | $\overline{\text{AFD}}$ | | Taking pin low generates line feed. |
| 15 | NC | | |
| 16 | 0V | | |
| 17 | CHASSIS GND | | |
| 18 | +5V | | +5V (50mA max) power supply output. |
| 19 | GND | | Signal ground. |
| 20 | GND | | Signal ground. |
| 21 | GND | | Signal ground. |

| PIN | DESIGNATION | I/O | DESCRIPTION |
|---|---|---|---|
| 22 | GND | | Signal ground. |
| 23 | GND | | Signal ground. |
| 24 | GND | | Signal ground. |
| 24 | GND | | Signal ground. |
| 26 | GND | | Signal ground. |
| 27 | GND | | Signal ground. |
| 28 | GND | | Signal ground. |
| 29 | GND | | Signal ground. |
| 30 | GND | | Signal ground. |
| 31 | $\overline{\text{INPUT PRIME}}$ | IN | Taking pin low initialises printer. Minimum necessary pulse width is 100$\mu$S. |
| 32 | $\overline{\text{FAULT}}$ | OUT | Output low when off line. |
| 33 | GND | | |
| 34 | NC | | |
| 35 | +5V | OUT | |
| 36 | $\overline{\text{SLCT IN}}$ | IN | Taking pin low or high sets printer on line or off line respectively (when the printer is not in error condition). |

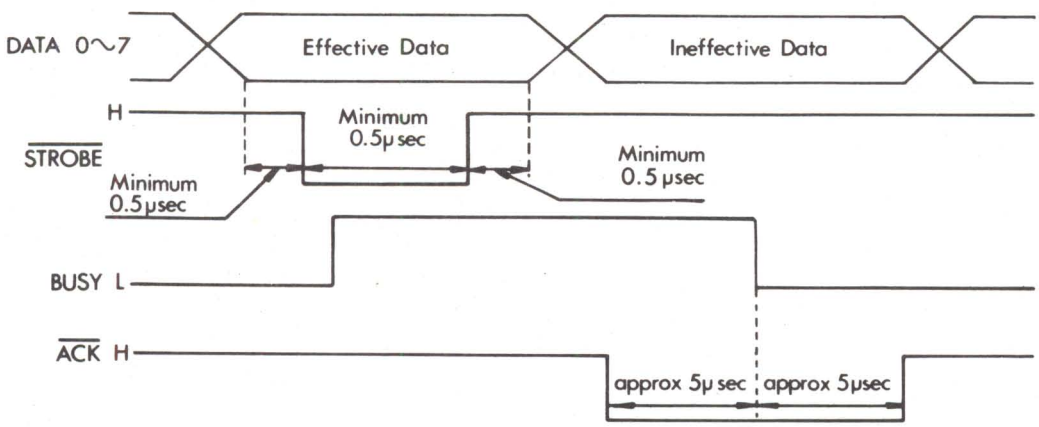
# DIP switch functions

Chapter 2 described how to adjust DIP switch DS1-7, and also how to adjust DS1-1, DS1-2, DS1-3 to select the required international characters. The following table indicates the functions of the remaining DIP switches:

| SWITCH | FUNCTION | OFF | ON |
|---|---|---|---|
| DS1-1 | International characters | See chapter 2 | See chapter 2 |
| DS1-2 | International characters | See chapter 2 | See chapter 2 |
| DS1-3 | International characters | See chapter 2 | See chapter 2 |
| DS1-4 | Page length | 11 inch | 12 inch |
| DS1-5 | Default skip perforation | Disable | Enable |
| DS1-6 | Alarm bleeper | Disable | Enable |
| DS1-7 | Print mode | Standard | LQ |
| DS1-8 | SLCT IN signal | Not sent | Automatically sent |
| DS2-1 | Paper out sensor | Enable | Disable |
| DS2-2 | CR function | CR only | CR and LF |
| DS2-3 | Zero character | Unslashed | Slashed |
| DS2-4 | Reserved | | |
| DS2-5 | Character set | Epson | IBM |
| DS2-6 | Unused | | |
| DS2-7 | Reserved | | |
| DS2-8 | Reserved | | |

**REMEMBER:** Always switch the printer *off* before adjusting the DIP switches.

# Signal timing




**DATA input waveform**

# If your printer stops printing

Despite everybody's best efforts, even the finest machinery breaks down sometimes. Should your LQ3500 detect that something is amiss, it will let you know with a combination of flashing lights and bleeping noises. The paper out alarm is a good example of this, and also demonstrates that 'failures' are sometimes recoverable and not always catastrophic.

When the paper runs out, the PAPER OUT light comes on and the ON LINE light goes out. This will not happen if you have set DS2-1 to ignore paper out.

The remedy is, of course, to feed it some paper and press the ON LINE button.

Should the motor in the printer not feed the paper through correctly, the MODE light will flash, and the printer will make groups of five beeps. If this fault persists, first make sure there are no obstructions in the printer (pens, sticky labels, paperclips, chewing gum, etc.). If the cause of the fault still cannot be detected, then return the printer to your dealer.

During very long printing sessions, or while printing exceptionally black graphics, the print head may get rather warm. To prevent damage to the head, the printer stops for a while to cool off if the head temperature exceeds 130°C. While it is cooling off, the ON LINE light will flash.

Should an internal memory error occur inside the printer, the printer emits single bleeps and flashes the ON LINE and either the MODE or PAPER OUT lights. If this error persists, return the printer to your dealer.

# Appendix 1
# Table of control codes

| CODE | DECIMAL | HEX | FUNCTION |
|---|---|---|---|
| BEL | 7 | &07 | Sound bleeper |
| BS | 8 | &08 | Back space |
| HT | 9 | &09 | Horizontal tab jump |
| LF | 10 | &0A | Line feed |
| VT | 11 | &0B | Vertical tab jump |
| FF | 12 | &0C | Form feed |
| CR | 13 | &0D | Carriage return |
| SO | 14 | &0E | Select one-line double width |
| SI | 15 | &0F | Select condensed |
| DC1 | 17 | &11 | Device control 1 |
| DC2 | 18 | &12 | Cancel condensed |
| DC3 | 19 | &13 | Device control 3 |
| DC4 | 20 | &14 | Cancel double width |
| CAN | 24 | &18 | Clear print buffer |
| DEL | 127 | &7F | Delete last character |
| ESC SO | 27 14 | &1B &0E | Select on-line double width |
| ESC SI | 27 15 | &1B &0F | Select condensed |
| ESC EM ‹parameter› | 27 25 ‹n› | &1B &19 ‹n› | ASF control (not supported) |
| ESC SPC ‹parameter› | 27 32 ‹n› | &1B &20 ‹n› | Select character space |
| ESC ! ‹parameter› | 27 33 ‹n› | &1B &21 ‹n› | Select print mode |
| ESC # | 27 35 | &1B &23 | Accept eighth bit |
| ESC $ ‹parameters› | 27 36 ‹n›.. | &1B &24 ‹n›.. | Absolute print position |
| ESC % ‹parameters› | 27 37 ‹n›.. | &1B &25 ‹n›.. | Select internal or download character set |
| ESC & NUL ‹parameters› | 27 38 0 ‹n›.. | &1B &26 &00 ‹n›.. | Define download character |
| ESC * ‹parameters› | 27 42 ‹n›.. | &1B &2A ‹n›.. | Select bit image graphics |
| ESC - ‹parameter› | 27 45 ‹n› | &1B &2D ‹n› | Select or cancel underline |
| ESC / ‹parameter› | 27 47 ‹n› | &1B &2F ‹n› | Select tab channel |
| ESC Ø | 27 48 | &1B &30 | Select 1/8 inch paper feed |
| ESC 2 | 27 50 | &1B &32 | Select 1/6 inch paper feed |

| CODE | DECIMAL | HEX | FUNCTION |
|---|---|---|---|
| ESC 3 ‹parameter› | 27 51 ‹n› | &1B &33 ‹n› | Select variable ‹n›/180 inch paper feed |
| ESC 4 | 27 52 | &1B &34 | Select italics |
| ESC 5 | 27 53 | &1B &35 | Cancel italics |
| ESC 6 | 27 54 | &1B &36 | Select IBM #2 (if in IBM mode) |
| ESC 7 | 27 55 | &1B &37 | Select IBM #1 (if in IBM mode) |
| ESC 8 | 27 56 | &1B &38 | Disable paper out detection |
| ESC 9 | 27 57 | &1B &39 | Enable paper out detection |
| ESC : NUL ‹parameters› | 27 58 0 ‹n›.. | &1B &3A &00 ‹n›.. | Copy internal character set into download set |
| ESC < | 27 60 | &1B &3C | Left to right printing |
| ESC = | 27 61 | &1B &3D | Unset eighth bit to 0 |
| ESC > | 27 62 | &1B &3E | Set eighth bit to 1 |
| ESC ? ‹parameters› | 27 63 ‹n›.. | &1B &3F ‹n›.. | Select/change bit image mode |
| ESC @ | 27 64 | &1B &40 | Reset printer |
| ESC A ‹parameter› | 27 65 ‹n› | &1B &41 ‹n› | Select variable ‹n›/60 inch paper feed |
| ESC B ‹parameters› NUL | 27 66 ‹n›.. 0 | &1B &42 ‹n›.. &00 | Set vertical tabs |
| ESC C ‹parameter› | 27 67 ‹n› | &1B &43 ‹n› | Set page length (by lines) |
| ESC C NUL ‹parameter› | 27 67 0 ‹n› | &1B &43 &00 ‹n› | Set page length (by inches) |
| ESC D ‹parameters› NUL | 27 68 ‹n›.. 0 | &1B &44 ‹n›.. &00 | Set horizontal tabs |
| ESC E | 27 69 | &1B &45 | Select bold |
| ESC F | 27 70 | &1B &46 | Cancel bold |
| ESC G | 27 71 | &1B &47 | Select double strike |
| ESC H | 27 72 | &1B &48 | Cancel double strike |
| ESC J ‹parameter› | 27 74 ‹n› | &1B &4A ‹n› | Select variable ‹n›/180 inch one-shot forward |
| ESC K ‹parameters› | 27 75 ‹n›.. | &1B &4B ‹n›.. | Select single density graphics |
| ESC L ‹parameters› | 27 76 ‹n›.. | &1B &4C ‹n›.. | Select double density graphics |

| CODE | DECIMAL | HEX | FUNCTION |
|---|---|---|---|
| ESC M | 27 77 | &1B &4D | Select mini (Elite) pitch |
| ESC N ‹parameters› | 27 78 ‹n›.. | &1B &4E ‹n›.. | Select skip perforation |
| ESC O | 27 79 | &1B &4F | Cancel skip perforation |
| ESC P | 27 80 | &1B &50 | Cancel mini (set Pica) |
| ESC Q ‹parameter› | 27 81 ‹n› | &1B &51 ‹n› | Set right margin |
| ESC R ‹parameter› | 27 82 ‹n› | &1B &52 ‹n› | Select international character set |
| ESC S ‹parameter› | 27 83 ‹n› | &1B &53 ‹n› | Select subscript or superscript |
| ESC T | 27 84 | &1B &54 | Cancel subscript and superscript |
| ESC U ‹parameter› | 27 85 ‹n› | &1B &55 ‹n› | Select or cancel uni-directional printing |
| ESC V ‹parameters› | 27 86 ‹n›.. | &1B &56 ‹n›.. | Repeating print |
| ESC W ‹parameter› | 27 87 ‹n› | &1B &57 ‹n› | Select or cancel double-width |
| ESC Y ‹parameters› | 27 89 ‹n›.. | &1B &59 ‹n›.. | Select double speed double density graphics |
| ESC Z ‹parameters› | 27 90 ‹n›.. | &1B &5A ‹n›.. | Select quadruple density graphics |
| ESC \ ‹parameters› | 27 92 ‹n›.. | &1B &5C ‹n›.. | Set relative position |
| ESC a ‹parameter› | 27 97 ‹n› | &1B &61 ‹n› | Set justification type |
| ESC b ‹parameters› NUL | 27 98 ‹n›.. 0 | &1B &62 ‹n›.. &00 | Set tabs in tab channel |
| ESC j ‹parameter› feed | 27 106 ‹n› | &1B &6A ‹n› | Select variable ‹n›/180 inch one-shot reverse |
| ESC k ‹parameter› | 27 107 ‹n› | &1B &6B ‹n› | Select type style (not supported) |
| ESC l ‹parameter› | 27 108 ‹n› | &1B &6C ‹n› | Set left margin |
| ESC p ‹parameter› | 27 112 ‹n› | &1B &70 ‹n› | Select or cancel proportional |
| ESC s ‹parameter› | 27 115 ‹n› | &1B &73 ‹n› | Select or cancel half speed printing |
| ESC t ‹parameter› | 27 116 ‹n› | &1B &74 ‹n› | Select Epson/IBM character set |
| ESC x ‹parameter› | 27 120 ‹n › | &1B &7 8 ‹n› | Select or cancel LQ |

# Appendix 2
# Character tables

NOTE: The following character tables may be selected using DIP switch DS2-5, DS1-7, and ESC 6 or 7, or alternatively, by the control code ESC t ‹n› (see chapter 6 under the section entitled 'Character table selection').

**Table 1 (DS1-7 off, DS2-5 off)**
**Epson - standard**

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | |
| &00 | &01 | &02 | &03 | &04 | &05 | &06 | &07 | &08 | &09 | &0A | &0B | &0C | &0D | &0E | &0F |

| 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | |
| &10 | &11 | &12 | &13 | &14 | &15 | &16 | &17 | &18 | &19 | &1A | &1B | &1C | &1D | &1E | &1F |

| 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ! | " | # | $ | % | & | ' | ( | ) | * | + | , | - | . | / |
| &20 | &21 | &22 | &23 | &24 | &25 | &26 | &27 | &28 | &29 | &2A | &2B | &2C | &2D | &2E | &2F |

| 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 | 63 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | : | ; | < | = | > | ? |
| &30 | &31 | &32 | &33 | &34 | &35 | &36 | &37 | &38 | &39 | &3A | &3B | &3C | &3D | &3E | &3F |

| 64 | 65 | 66 | 67 | 68 | 69 | 70 | 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| @ | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O |
| &40 | &41 | &42 | &43 | &44 | &45 | &46 | &47 | &48 | &49 | &4A | &4B | &4C | &4D | &4E | &4F |

| 80 | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 | 94 | 95 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | Q | R | S | T | U | V | W | X | Y | Z | [ | \ | ] | ^ | _ |
| &50 | &51 | &52 | &53 | &54 | &55 | &56 | &57 | &58 | &59 | &5A | &5B | &5C | &5D | &5E | &5F |

....continued

**Table 1 continued....**

| 96 | 97 | 98 | 99 | 100 | 101 | 102 | 103 | 104 | 105 | 106 | 107 | 108 | 109 | 110 | 111 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ` | a | b | c | d | e | f | g | h | i | j | k | l | m | n | o |
| &60 | &61 | &62 | &63 | &64 | &65 | &66 | &67 | &68 | &69 | &6A | &6B | &6C | &6D | &6E | &6F |

| 112 | 113 | 114 | 115 | 116 | 117 | 118 | 119 | 120 | 121 | 122 | 123 | 124 | 125 | 126 | 127 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| p | q | r | s | t | u | v | w | x | y | z | { | ¦ | } | ~ | |
| &70 | &71 | &72 | &73 | &74 | &75 | &76 | &77 | &78 | &79 | &7A | &7B | &7C | &7D | &7E | &7F |

| 128 | 129 | 130 | 131 | 132 | 133 | 134 | 135 | 136 | 137 | 138 | 139 | 140 | 141 | 142 | 143 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | |
| &80 | &81 | &82 | &83 | &84 | &85 | &86 | &87 | &88 | &89 | &8A | &8B | &8C | &8D | &8E | &8F |

| 144 | 145 | 146 | 147 | 148 | 149 | 150 | 151 | 152 | 153 | 154 | 155 | 156 | 157 | 158 | 159 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | |
| &90 | &91 | &92 | &93 | &94 | &95 | &96 | &97 | &98 | &99 | &9A | &9B | &9C | &9D | &9E | &9F |

| 160 | 161 | 162 | 163 | 164 | 165 | 166 | 167 | 168 | 169 | 170 | 171 | 172 | 173 | 174 | 175 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ! | " | # | $ | % | & | ' | ( | ) | * | + | , | - | . | / |
| &A0 | &A1 | &A2 | &A3 | &A4 | &A5 | &A6 | &A7 | &A8 | &A9 | &AA | &AB | &AC | &AD | &AE | &AF |

| 176 | 177 | 178 | 179 | 180 | 181 | 182 | 183 | 184 | 185 | 186 | 187 | 188 | 189 | 190 | 191 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | : | ; | < | = | > | ? |
| &B0 | &B1 | &B2 | &B3 | &B4 | &B5 | &B6 | &B7 | &B8 | &B9 | &BA | &BB | &BC | &BD | &BE | &BF |

| 192 | 193 | 194 | 195 | 196 | 197 | 198 | 199 | 200 | 201 | 202 | 203 | 204 | 205 | 206 | 207 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| @ | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O |
| &C0 | &C1 | &C2 | &C3 | &C4 | &C5 | &C6 | &C7 | &C8 | &C9 | &CA | &CB | &CC | &CD | &CE | &CF |

....continued

**Table 1 continued....**

| 208 | 209 | 210 | 211 | 212 | 213 | 214 | 215 | 216 | 217 | 218 | 219 | 220 | 221 | 222 | 223 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | Q | R | S | T | U | V | W | X | Y | Z | [ | \ | ] | ^ | _ |
| &D0 | &D1 | &D2 | &D3 | &D4 | &D5 | &D6 | &D7 | &D8 | &D9 | &DA | &DB | &DC | &DD | &DE | &DF |

| 224 | 225 | 226 | 227 | 228 | 229 | 230 | 231 | 232 | 233 | 234 | 235 | 236 | 237 | 238 | 239 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ` | a | b | c | d | e | f | g | h | i | j | k | l | m | n | o |
| &E0 | &E1 | &E2 | &E3 | &E4 | &E5 | &E6 | &E7 | &E8 | &E9 | &EA | &EB | &EC | &ED | &EE | &EF |

| 240 | 241 | 242 | 243 | 244 | 245 | 246 | 247 | 248 | 249 | 250 | 251 | 252 | 253 | 254 | 255 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| p | q | r | s | t | u | v | w | x | y | z | { | \| | } | ~ | |
| &F0 | &F1 | &F2 | &F3 | &F4 | &F5 | &F6 | &F7 | &F8 | &F9 | &FA | &FB | &FC | &FD | &FE | &FF |

## Table 2 (DS1-7 on, DS2-5 off)
## Epson - LQ

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | |
| &00 | &01 | &02 | &03 | &04 | &05 | &06 | &07 | &08 | &09 | &0A | &0B | &0C | &0D | &0E | &0F |

| 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | |
| &10 | &11 | &12 | &13 | &14 | &15 | &16 | &17 | &18 | &19 | &1A | &1B | &1C | &1D | &1E | &1F |

| 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ! | " | # | $ | % | & | ' | ( | ) | * | + | , | - | . | / |
| &20 | &21 | &22 | &23 | &24 | &25 | &26 | &27 | &28 | &29 | &2A | &2B | &2C | &2D | &2E | &2F |

| 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 | 63 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | : | ; | < | = | > | ? |
| &30 | &31 | &32 | &33 | &34 | &35 | &36 | &37 | &38 | &39 | &3A | &3B | &3C | &3D | &3E | &3F |

| 64 | 65 | 66 | 67 | 68 | 69 | 70 | 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| @ | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O |
| &40 | &41 | &42 | &43 | &44 | &45 | &46 | &47 | &48 | &49 | &4A | &4B | &4C | &4D | &4E | &4F |

| 80 | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 | 94 | 95 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | Q | R | S | T | U | V | W | X | Y | Z | [ | \ | ] | ^ | _ |
| &50 | &51 | &52 | &53 | &54 | &55 | &56 | &57 | &58 | &59 | &5A | &5B | &5C | &5D | &5E | &5F |

| 96 | 97 | 98 | 99 | 100 | 101 | 102 | 103 | 104 | 105 | 106 | 107 | 108 | 109 | 110 | 111 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ` | a | b | c | d | e | f | g | h | i | j | k | l | m | n | o |
| &60 | &61 | &62 | &63 | &64 | &65 | &66 | &67 | &68 | &69 | &6A | &6B | &6C | &6D | &6E | &6F |

**Table 2 continued....**

| 112 | 113 | 114 | 115 | 116 | 117 | 118 | 119 | 120 | 121 | 122 | 123 | 124 | 125 | 126 | 127 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| p | q | r | s | t | u | v | w | x | y | z | { | ¦ | } | ~ | |
| &70 | &71 | &72 | &73 | &74 | &75 | &76 | &77 | &78 | &79 | &7A | &7B | &7C | &7D | &7E | &7F |

| 128 | 129 | 130 | 131 | 132 | 133 | 134 | 135 | 136 | 137 | 138 | 139 | 140 | 141 | 142 | 143 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | |
| &80 | &81 | &82 | &83 | &84 | &85 | &86 | &87 | &88 | &89 | &8A | &8B | &8C | &8D | &8E | &8F |

| 144 | 145 | 146 | 147 | 148 | 149 | 150 | 151 | 152 | 153 | 154 | 155 | 156 | 157 | 158 | 159 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | |
| &90 | &91 | &92 | &93 | &94 | &95 | &96 | &97 | &98 | &99 | &9A | &9B | &9C | &9D | &9E | &9F |

| 160 | 161 | 162 | 163 | 164 | 165 | 166 | 167 | 168 | 169 | 170 | 171 | 172 | 173 | 174 | 175 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ! | " | # | $ | % | & | ' | ( | ) | * | + | , | - | . | / |
| &A0 | &A1 | &A2 | &A3 | &A4 | &A5 | &A6 | &A7 | &A8 | &A9 | &AA | &AB | &AC | &AD | &AE | &AF |

| 176 | 177 | 178 | 179 | 180 | 181 | 182 | 183 | 184 | 185 | 186 | 187 | 188 | 189 | 190 | 191 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | : | ; | < | = | > | ? |
| &B0 | &B1 | &B2 | &B3 | &B4 | &B5 | &B6 | &B7 | &B8 | &B9 | &BA | &BB | &BC | &BD | &BE | &BF |

| 192 | 193 | 194 | 195 | 196 | 197 | 198 | 199 | 200 | 201 | 202 | 203 | 204 | 205 | 206 | 207 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| @ | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O |
| &C0 | &C1 | &C2 | &C3 | &C4 | &C5 | &C6 | &C7 | &C8 | &C9 | &CA | &CB | &CC | &CD | &CE | &CF |

| 208 | 209 | 210 | 211 | 212 | 213 | 214 | 215 | 216 | 217 | 218 | 219 | 220 | 221 | 222 | 223 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | Q | R | S | T | U | V | W | X | Y | Z | [ | \ | ] | ^ | _ |
| &D0 | &D1 | &D2 | &D3 | &D4 | &D5 | &D6 | &D7 | &D8 | &D9 | &DA | &DB | &DC | &DD | &DE | &DF |

....continued

**Table 2 continued....**

| 224 | 225 | 226 | 227 | 228 | 229 | 230 | 231 | 232 | 233 | 234 | 235 | 236 | 237 | 238 | 239 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ` | *a* | *b* | *c* | *d* | *e* | *f* | *g* | *h* | *i* | *j* | *k* | *l* | *m* | *n* | *o* |
| &E0 | &E1 | &E2 | &E3 | &E4 | &E5 | &E6 | &E7 | &E8 | &E9 | &EA | &EB | &EC | &ED | &EE | &EF |

| 240 | 241 | 242 | 243 | 244 | 245 | 246 | 247 | 248 | 249 | 250 | 251 | 252 | 253 | 254 | 255 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *p* | *q* | *r* | *s* | *t* | *u* | *v* | *w* | *x* | *y* | *z* | { | ¦ | } | ~ | |
| &F0 | &F1 | &F2 | &F3 | &F4 | &F5 | &F6 | &F7 | &F8 | &F9 | &FA | &FB | &FC | &FD | &FE | &FF |

**Table 3.1 (DS1-7 off, DS2-5 on)**
**IBM character set #1 - standard**

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | |
| &00 | &01 | &02 | &03 | &04 | &05 | &06 | &07 | &08 | &09 | &0A | &0B | &0C | &0D | &0E | &0F |

| 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | |
| &10 | &11 | &12 | &13 | &14 | &15 | &16 | &17 | &18 | &19 | &1A | &1B | &1C | &1D | &1E | &1F |

| 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ! | " | # | $ | % | & | ' | ( | ) | * | + | , | - | . | / |
| &20 | &21 | &22 | &23 | &24 | &25 | &26 | &27 | &28 | &29 | &2A | &2B | &2C | &2D | &2E | &2F |

| 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 | 63 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | : | ; | < | = | > | ? |
| &30 | &31 | &32 | &33 | &34 | &35 | &36 | &37 | &38 | &39 | &3A | &3B | &3C | &3D | &3E | &3F |

| 64 | 65 | 66 | 67 | 68 | 69 | 70 | 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| @ | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O |
| &40 | &41 | &42 | &43 | &44 | &45 | &46 | &47 | &48 | &49 | &4A | &4B | &4C | &4D | &4E | &4F |

| 80 | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 | 94 | 95 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | Q | R | S | T | U | V | W | X | Y | Z | [ | \ | ] | ^ | _ |
| &50 | &51 | &52 | &53 | &54 | &55 | &56 | &57 | &58 | &59 | &5A | &5B | &5C | &5D | &5E | &5F |

| 96 | 97 | 98 | 99 | 100 | 101 | 102 | 103 | 104 | 105 | 106 | 107 | 108 | 109 | 110 | 111 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ` | a | b | c | d | e | f | g | h | i | j | k | l | m | n | o |
| &60 | &61 | &62 | &63 | &64 | &65 | &66 | &67 | &68 | &69 | &6A | &6B | &6C | &6D | &6E | &6F |

....continued

**Table 3.1 continued....**

| 112 | 113 | 114 | 115 | 116 | 117 | 118 | 119 | 120 | 121 | 122 | 123 | 124 | 125 | 126 | 127 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| p | q | r | s | t | u | v | w | x | y | z | { | \| | } | ~ | |
| &70 | &71 | &72 | &73 | &74 | &75 | &76 | &77 | &78 | &79 | &7A | &7B | &7C | &7D | &7E | &7F |

| 128 | 129 | 130 | 131 | 132 | 133 | 134 | 135 | 136 | 137 | 138 | 139 | 140 | 141 | 142 | 143 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | |
| &80 | &81 | &82 | &83 | &84 | &85 | &86 | &87 | &88 | &89 | &8A | &8B | &8C | &8D | &8E | &8F |

| 144 | 145 | 146 | 147 | 148 | 149 | 150 | 151 | 152 | 153 | 154 | 155 | 156 | 157 | 158 | 159 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | |
| &90 | &91 | &92 | &93 | &94 | &95 | &96 | &97 | &98 | &99 | &9A | &9B | &9C | &9D | &9E | &9F |

| 160 | 161 | 162 | 163 | 164 | 165 | 166 | 167 | 168 | 169 | 170 | 171 | 172 | 173 | 174 | 175 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| á | í | ó | ú | ñ | Ñ | ª | º | ¿ | ⌐ | ¬ | ½ | ¼ | ¡ | « | » |
| &A0 | &A1 | &A2 | &A3 | &A4 | &A5 | &A6 | &A7 | &A8 | &A9 | &AA | &AB | &AC | &AD | &AE | &AF |

| 176 | 177 | 178 | 179 | 180 | 181 | 182 | 183 | 184 | 185 | 186 | 187 | 188 | 189 | 190 | 191 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ▒ | ▒ | ▓ | │ | ┤ | ╡ | ╢ | ╖ | ╕ | ╣ | ║ | ╗ | ╝ | ╜ | ╛ | ┐ |
| &B0 | &B1 | &B2 | &B3 | &B4 | &B5 | &B6 | &B7 | &B8 | &B9 | &BA | &BB | &BC | &BD | &BE | &BF |

| 192 | 193 | 194 | 195 | 196 | 197 | 198 | 199 | 200 | 201 | 202 | 203 | 204 | 205 | 206 | 207 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| └ | ┴ | ┬ | ├ | ─ | ┼ | ╞ | ╟ | ╚ | ╔ | ╩ | ╦ | ╠ | ═ | ╬ | ╧ |
| &C0 | &C1 | &C2 | &C3 | &C4 | &C5 | &C6 | &C7 | &C8 | &C9 | &CA | &CB | &CC | &CD | &CE | &CF |

| 208 | 209 | 210 | 211 | 212 | 213 | 214 | 215 | 216 | 217 | 218 | 219 | 220 | 221 | 222 | 223 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ╨ | ╤ | ╥ | ╙ | ╘ | ╒ | ╓ | ╫ | ╪ | ┘ | ┌ | ▒ | ▄ | ▌ | ▐ | ▀ |
| &D0 | &D1 | &D2 | &D3 | &D4 | &D5 | &D6 | &D7 | &D8 | &D9 | &DA | &DB | &DC | &DD | &DE | &DF |

....continued

**Table 3.1 continued....**

| 224 | 225 | 226 | 227 | 228 | 229 | 230 | 231 | 232 | 233 | 234 | 235 | 236 | 237 | 238 | 239 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| α | ß | Γ | π | Σ | σ | µ | τ | Φ | Θ | Ω | δ | ∞ | ø | ∈ | ∩ |
| &E0 | &E1 | &E2 | &E3 | &E4 | &E5 | &E6 | &E7 | &E8 | &E9 | &EA | &EB | &EC | &ED | &EE | &EF |

| 240 | 241 | 242 | 243 | 244 | 245 | 246 | 247 | 248 | 249 | 250 | 251 | 252 | 253 | 254 | 255 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ≡ | ± | ≥ | ≤ | ⌠ | ⌡ | ÷ | ≈ | ° | ∙ | · | √ | ⁿ | ² | ■ | |
| &F0 | &F1 | &F2 | &F3 | &F4 | &F5 | &F6 | &F7 | &F8 | &F9 | &FA | &FB | &FC | &FD | &FE | &FF |

**Table 3.2 (DS1-7 off, DS2-5 on, ESC t SOH)**
**IBM character set #2 - standard**

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | ♥ | ♦ | ♣ | ♠ | | | | | | | | | |
| &00 | &01 | &02 | &03 | &04 | &05 | &06 | &07 | &08 | &09 | &0A | &0B | &0C | &0D | &0E | &0F |

| 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | § | | | | | | | | | | |
| &10 | &11 | &12 | &13 | &14 | &15 | &16 | &17 | &18 | &19 | &1A | &1B | &1C | &1D | &1E | &1F |

| 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ! | " | # | $ | % | & | ' | ( | ) | * | + | , | - | . | / |
| &20 | &21 | &22 | &23 | &24 | &25 | &26 | &27 | &28 | &29 | &2A | &2B | &2C | &2D | &2E | &2F |

| 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 | 63 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | : | ; | < | = | > | ? |
| &30 | &31 | &32 | &33 | &34 | &35 | &36 | &37 | &38 | &39 | &3A | &3B | &3C | &3D | &3E | &3F |

| 64 | 65 | 66 | 67 | 68 | 69 | 70 | 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| @ | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O |
| &40 | &41 | &42 | &43 | &44 | &45 | &46 | &47 | &48 | &49 | &4A | &4B | &4C | &4D | &4E | &4F |

| 80 | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 | 94 | 95 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | Q | R | S | T | U | V | W | X | Y | Z | [ | \ | ] | ^ | _ |
| &50 | &51 | &52 | &53 | &54 | &55 | &56 | &57 | &58 | &59 | &5A | &5B | &5C | &5D | &5E | &5F |

| 96 | 97 | 98 | 99 | 100 | 101 | 102 | 103 | 104 | 105 | 106 | 107 | 108 | 109 | 110 | 111 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ` | a | b | c | d | e | f | g | h | i | j | k | l | m | n | o |
| &60 | &61 | &62 | &63 | &64 | &65 | &66 | &67 | &68 | &69 | &6A | &6B | &6C | &6D | &6E | &6F |

....continued

**Table 3.2 continued....**

| 112 | 113 | 114 | 115 | 116 | 117 | 118 | 119 | 120 | 121 | 122 | 123 | 124 | 125 | 126 | 127 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| p | q | r | s | t | u | v | w | x | y | z | { | \| | } | ~ | |
| &70 | &71 | &72 | &73 | &74 | &75 | &76 | &77 | &78 | &79 | &7A | &7B | &7C | &7D | &7E | &7F |

| 128 | 129 | 130 | 131 | 132 | 133 | 134 | 135 | 136 | 137 | 138 | 139 | 140 | 141 | 142 | 143 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ç | ü | é | â | ä | à | å | ç | ê | ë | è | ï | î | ì | Ä | Å |
| &80 | &81 | &82 | &83 | &84 | &85 | &86 | &87 | &88 | &89 | &8A | &8B | &8C | &8D | &8E | &8F |

| 144 | 145 | 146 | 147 | 148 | 149 | 150 | 151 | 152 | 153 | 154 | 155 | 156 | 157 | 158 | 159 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| É | æ | Æ | ô | ö | ò | û | ù | ÿ | Ö | Ü | ¢ | £ | ¥ | ₧ | ƒ |
| &90 | &91 | &92 | &93 | &94 | &95 | &96 | &97 | &98 | &99 | &9A | &9B | &9C | &9D | &9E | &9F |

| 160 | 161 | 162 | 163 | 164 | 165 | 166 | 167 | 168 | 169 | 170 | 171 | 172 | 173 | 174 | 175 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| á | í | ó | ú | ñ | Ñ | ª | º | ¿ | ⌐ | ¬ | ½ | ¼ | ¡ | « | » |
| &A0 | &A1 | &A2 | &A3 | &A4 | &A5 | &A6 | &A7 | &A8 | &A9 | &AA | &AB | &AC | &AD | &AE | &AF |

| 176 | 177 | 178 | 179 | 180 | 181 | 182 | 183 | 184 | 185 | 186 | 187 | 188 | 189 | 190 | 191 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ▒ | ▒ | ▓ | \| | ┤ | ╡ | ╢ | ╖ | ╕ | ╣ | ║ | ╗ | ╝ | ╜ | ╛ | ┐ |
| &B0 | &B1 | &B2 | &B3 | &B4 | &B5 | &B6 | &B7 | &B8 | &B9 | &BA | &BB | &BC | &BD | &BE | &BF |

| 192 | 193 | 194 | 195 | 196 | 197 | 198 | 199 | 200 | 201 | 202 | 203 | 204 | 205 | 206 | 207 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| └ | ┴ | ┬ | ├ | ─ | ┼ | ╞ | ╟ | ╚ | ╔ | ╩ | ╦ | ╠ | ═ | ╬ | ╧ |
| &C0 | &C1 | &C2 | &C3 | &C4 | &C5 | &C6 | &C7 | &C8 | &C9 | &CA | &CB | &CC | &CD | &CE | &CF |

| 208 | 209 | 210 | 211 | 212 | 213 | 214 | 215 | 216 | 217 | 218 | 219 | 220 | 221 | 222 | 223 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ╨ | ╤ | ╥ | ╙ | ╘ | ╒ | ╓ | ╫ | ╪ | ┘ | ┌ | ▉ | ▄ | ▌ | ▐ | ▀ |
| &D0 | &D1 | &D2 | &D3 | &D4 | &D5 | &D6 | &D7 | &D8 | &D9 | &DA | &DB | &DC | &DD | &DE | &DF |

....continued

**Table 3.2 continued....**

| 224 | 225 | 226 | 227 | 228 | 229 | 230 | 231 | 232 | 233 | 234 | 235 | 236 | 237 | 238 | 239 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $\alpha$ | $\beta$ | $\Gamma$ | $\pi$ | $\Sigma$ | $\sigma$ | $\mu$ | $\tau$ | $\Phi$ | $\Theta$ | $\Omega$ | $\delta$ | $\infty$ | $\emptyset$ | $\in$ | $\cap$ |
| &E0 | &E1 | &E2 | &E3 | &E4 | &E5 | &E6 | &E7 | &E8 | &E9 | &EA | &EB | &EC | &ED | &EE | &EF |

| 240 | 241 | 242 | 243 | 244 | 245 | 246 | 247 | 248 | 249 | 250 | 251 | 252 | 253 | 254 | 255 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $\equiv$ | $\pm$ | $\geq$ | $\leq$ | $\lceil$ | $\rfloor$ | $\div$ | $\approx$ | $^{\circ}$ | $\cdot$ | $\sqrt{}$ | $^{n}$ | $^{2}$ | $\blacksquare$ | | |
| &F0 | &F1 | &F2 | &F3 | &F4 | &F5 | &F6 | &F7 | &F8 | &F9 | &FA | &FB | &FC | &FD | &FE | &FF |

## Table 4.1 (DS1-7 on, DS2-5 on)
## IBM character set #1 - LQ

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | |
| &00 | &01 | &02 | &03 | &04 | &05 | &06 | &07 | &08 | &09 | &0A | &0B | &0C | &0D | &0E | &0F |

| 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | |
| &10 | &11 | &12 | &13 | &14 | &15 | &16 | &17 | &18 | &19 | &1A | &1B | &1C | &1D | &1E | &1F |

| 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ! | " | # | $ | % | & | ' | ( | ) | * | + | , | - | . | / |
| &20 | &21 | &22 | &23 | &24 | &25 | &26 | &27 | &28 | &29 | &2A | &2B | &2C | &2D | &2E | &2F |

| 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 | 63 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | : | ; | < | = | > | ? |
| &30 | &31 | &32 | &33 | &34 | &35 | &36 | &37 | &38 | &39 | &3A | &3B | &3C | &3D | &3E | &3F |

| 64 | 65 | 66 | 67 | 68 | 69 | 70 | 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| @ | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O |
| &40 | &41 | &42 | &43 | &44 | &45 | &46 | &47 | &48 | &49 | &4A | &4B | &4C | &4D | &4E | &4F |

| 80 | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 | 94 | 95 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | Q | R | S | T | U | V | W | X | Y | Z | [ | \ | ] | ^ | _ |
| &50 | &51 | &52 | &53 | &54 | &55 | &56 | &57 | &58 | &59 | &5A | &5B | &5C | &5D | &5E | &5F |

| 96 | 97 | 98 | 99 | 100 | 101 | 102 | 103 | 104 | 105 | 106 | 107 | 108 | 109 | 110 | 111 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ` | a | b | c | d | e | f | g | h | i | j | k | l | m | n | o |
| &60 | &61 | &62 | &63 | &64 | &65 | &66 | &67 | &68 | &69 | &6A | &6B | &6C | &6D | &6E | &6F |

**Table 4.1 continued....**

| 112 | 113 | 114 | 115 | 116 | 117 | 118 | 119 | 120 | 121 | 122 | 123 | 124 | 125 | 126 | 127 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| p | q | r | s | t | u | v | w | x | y | z | { | ¦ | } | ~ | |
| &70 | &71 | &72 | &73 | &74 | &75 | &76 | &77 | &78 | &79 | &7A | &7B | &7C | &7D | &7E | &7F |

| 128 | 129 | 130 | 131 | 132 | 133 | 134 | 135 | 136 | 137 | 138 | 139 | 140 | 141 | 142 | 143 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | |
| &80 | &81 | &82 | &83 | &84 | &85 | &86 | &87 | &88 | &89 | &8A | &8B | &8C | &8D | &8E | &8F |

| 144 | 145 | 146 | 147 | 148 | 149 | 150 | 151 | 152 | 153 | 154 | 155 | 156 | 157 | 158 | 159 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | |
| &90 | &91 | &92 | &93 | &94 | &95 | &96 | &97 | &98 | &99 | &9A | &9B | &9C | &9D | &9E | &9F |

| 160 | 161 | 162 | 163 | 164 | 165 | 166 | 167 | 168 | 169 | 170 | 171 | 172 | 173 | 174 | 175 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| á | í | ó | ú | ñ | Ñ | ª | º | ¿ | ⌐ | ¬ | ½ | ¼ | ¡ | « | » |
| &A0 | &A1 | &A2 | &A3 | &A4 | &A5 | &A6 | &A7 | &A8 | &A9 | &AA | &AB | &AC | &AD | &AE | &AF |

| 176 | 177 | 178 | 179 | 180 | 181 | 182 | 183 | 184 | 185 | 186 | 187 | 188 | 189 | 190 | 191 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ▒ | ▒ | ▒ | ┃ | ┤ | ╡ | ╢ | ╖ | ╕ | ╣ | ║ | ╗ | ╝ | ╜ | ╛ | ┐ |
| &B0 | &B1 | &B2 | &B3 | &B4 | &B5 | &B6 | &B7 | &B8 | &B9 | &BA | &BB | &BC | &BD | &BE | &BF |

| 192 | 193 | 194 | 195 | 196 | 197 | 198 | 199 | 200 | 201 | 202 | 203 | 204 | 205 | 206 | 207 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| └ | ┴ | ┬ | ├ | ─ | ┼ | ╞ | ╟ | ╚ | ╔ | ╩ | ╦ | ╠ | ═ | ╬ | ╧ |
| &C0 | &C1 | &C2 | &C3 | &C4 | &C5 | &C6 | &C7 | &C8 | &C9 | &CA | &CB | &CC | &CD | &CE | &CF |

| 208 | 209 | 210 | 211 | 212 | 213 | 214 | 215 | 216 | 217 | 218 | 219 | 220 | 221 | 222 | 223 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ╨ | ╤ | ╥ | ╙ | ╘ | ╒ | ╓ | ╫ | ╪ | ┘ | ┌ | ▉ | ▄ | ▌ | ▐ | ▀ |
| &D0 | &D1 | &D2 | &D3 | &D4 | &D5 | &D6 | &D7 | &D8 | &D9 | &DA | &DB | &DC | &DD | &DE | &DF |

....continued

**Table 4.1 continued....**

| 224 | 225 | 226 | 227 | 228 | 229 | 230 | 231 | 232 | 233 | 234 | 235 | 236 | 237 | 238 | 239 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| α | β | Γ | π | Σ | σ | μ | τ | Φ | θ | Ω | δ | ∞ | ø | ∈ | ∩ |
| &E0 | &E1 | &E2 | &E3 | &E4 | &E5 | &E6 | &E7 | &E8 | &E9 | &EA | &EB | &EC | &ED | &EE | &EF |

| 240 | 241 | 242 | 243 | 244 | 245 | 246 | 247 | 248 | 249 | 250 | 251 | 252 | 253 | 254 | 255 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ≡ | ± | ≥ | ≤ | ⌠ | ⌡ | ÷ | ≈ | ° | ∙ | · | √ | ⁿ | ² | ■ | |
| &F0 | &F1 | &F2 | &F3 | &F4 | &F5 | &F6 | &F7 | &F8 | &F9 | &FA | &FB | &FC | &FD | &FE | &FF |

## Table 4.2 (DS1-7 on, DS2-5 on, ESC t STX)
## IBM character set #2 - LQ

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | ♥ | ♦ | ♣ | ♠ | | | | | | | | | |
| &00 | &01 | &02 | &03 | &04 | &05 | &06 | &07 | &08 | &09 | &0A | &0B | &0C | &0D | &0E | &0F |

| 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | § | | | | | | | | | | |
| &10 | &11 | &12 | &13 | &14 | &15 | &16 | &17 | &18 | &19 | &1A | &1B | &1C | &1D | &1E | &1F |

| 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ! | " | # | $ | % | & | ' | ( | ) | * | + | , | - | . | / |
| &20 | &21 | &22 | &23 | &24 | &25 | &26 | &27 | &28 | &29 | &2A | &2B | &2C | &2D | &2E | &2F |

| 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 | 63 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | : | ; | < | = | > | ? |
| &30 | &31 | &32 | &33 | &34 | &35 | &36 | &37 | &38 | &39 | &3A | &3B | &3C | &3D | &3E | &3F |

| 64 | 65 | 66 | 67 | 68 | 69 | 70 | 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| @ | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O |
| &40 | &41 | &42 | &43 | &44 | &45 | &46 | &47 | &48 | &49 | &4A | &4B | &4C | &4D | &4E | &4F |

| 80 | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 | 94 | 95 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | Q | R | S | T | U | V | W | X | Y | Z | [ | \ | ] | ^ | _ |
| &50 | &51 | &52 | &53 | &54 | &55 | &56 | &57 | &58 | &59 | &5A | &5B | &5C | &5D | &5E | &5F |

| 96 | 97 | 98 | 99 | 100 | 101 | 102 | 103 | 104 | 105 | 106 | 107 | 108 | 109 | 110 | 111 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ` | a | b | c | d | e | f | g | h | i | j | k | l | m | n | o |
| &60 | &61 | &62 | &63 | &64 | &65 | &66 | &67 | &68 | &69 | &6A | &6B | &6C | &6D | &6E | &6F |

**Table 4.2 continued....**

| 112 | 113 | 114 | 115 | 116 | 117 | 118 | 119 | 120 | 121 | 122 | 123 | 124 | 125 | 126 | 127 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| p | q | r | s | t | u | v | w | x | y | z | { | ¦ | } | ~ | |
| &70 | &71 | &72 | &73 | &74 | &75 | &76 | &77 | &78 | &79 | &7A | &7B | &7C | &7D | &7E | &7F |

| 128 | 129 | 130 | 131 | 132 | 133 | 134 | 135 | 136 | 137 | 138 | 139 | 140 | 141 | 142 | 143 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ç | ü | é | â | ä | à | å | ç | ê | ë | è | ï | î | ì | Ä | Å |
| &80 | &81 | &82 | &83 | &84 | &85 | &86 | &87 | &88 | &89 | &8A | &8B | &8C | &8D | &8E | &8F |

| 144 | 145 | 146 | 147 | 148 | 149 | 150 | 151 | 152 | 153 | 154 | 155 | 156 | 157 | 158 | 159 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| É | æ | Æ | ô | ö | ò | û | ù | ÿ | Ö | Ü | ¢ | £ | ¥ | ₧ | ƒ |
| &90 | &91 | &92 | &93 | &94 | &95 | &96 | &97 | &98 | &99 | &9A | &9B | &9C | &9D | &9E | &9F |

| 160 | 161 | 162 | 163 | 164 | 165 | 166 | 167 | 168 | 169 | 170 | 171 | 172 | 173 | 174 | 175 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| á | í | ó | ú | ñ | Ñ | ª | º | ¿ | ⌐ | ¬ | ½ | ¼ | ¡ | « | » |
| &A0 | &A1 | &A2 | &A3 | &A4 | &A5 | &A6 | &A7 | &A8 | &A9 | &AA | &AB | &AC | &AD | &AE | &AF |

| 176 | 177 | 178 | 179 | 180 | 181 | 182 | 183 | 184 | 185 | 186 | 187 | 188 | 189 | 190 | 191 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ▒ | ▒ | ▓ | │ | ┤ | ╡ | ╢ | ╖ | ╕ | ╣ | ║ | ╗ | ╝ | ╜ | ╛ | ┐ |
| &B0 | &B1 | &B2 | &B3 | &B4 | &B5 | &B6 | &B7 | &B8 | &B9 | &BA | &BB | &BC | &BD | &BE | &BF |

| 192 | 193 | 194 | 195 | 196 | 197 | 198 | 199 | 200 | 201 | 202 | 203 | 204 | 205 | 206 | 207 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| └ | ┴ | ┬ | ├ | ─ | ┼ | ╞ | ╟ | ╚ | ╔ | ╩ | ╦ | ╠ | ═ | ╬ | ╧ |
| &C0 | &C1 | &C2 | &C3 | &C4 | &C5 | &C6 | &C7 | &C8 | &C9 | &CA | &CB | &CC | &CD | &CE | &CF |

| 208 | 209 | 210 | 211 | 212 | 213 | 214 | 215 | 216 | 217 | 218 | 219 | 220 | 221 | 222 | 223 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ╨ | ╤ | ╥ | ╙ | ╘ | ╒ | ╓ | ╫ | ╪ | ┘ | ┌ | ▉ | ▄ | ▌ | ▐ | ▀ |
| &D0 | &D1 | &D2 | &D3 | &D4 | &D5 | &D6 | &D7 | &D8 | &D9 | &DA | &DB | &DC | &DD | &DE | &DF |

....continued

**Table 4.2 continued....**

| 224 | 225 | 226 | 227 | 228 | 229 | 230 | 231 | 232 | 233 | 234 | 235 | 236 | 237 | 238 | 239 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| α | β | Γ | π | Σ | σ | μ | τ | Φ | θ | Ω | δ | ∞ | ø | ∈ | ∩ |
| &E0 | &E1 | &E2 | &E3 | &E4 | &E5 | &E6 | &E7 | &E8 | &E9 | &EA | &EB | &EC | &ED | &EE | &EF |

| 240 | 241 | 242 | 243 | 244 | 245 | 246 | 247 | 248 | 249 | 250 | 251 | 252 | 253 | 254 | 255 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ≡ | ± | ≥ | ≤ | ⌠ | ⌡ | ÷ | ≈ | ° | ∙ | · | √ | $^{n}$ | $^{2}$ | ■ | |
| &F0 | &F1 | &F2 | &F3 | &F4 | &F5 | &F6 | &F7 | &F8 | &F9 | &FA | &FB | &FC | &FD | &FE | &FF |

NOTE: The printing of international characters using the character codes shown in chapter 2 (either by DIP switch DS1-1, DS1-2, DS1-3 selection, or by use of the ESC R ‹n› control code) is NOT possible while IBM character set #1 or #2 is in use. If, therefore, you wish to print international characters, ensure that you are not in IBM mode.

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# LQ3500 ADDENDUM

Please note the following corrections to the LQ3500 User Instructions:

**Page 9** - In the section entitled 'Fitting a mains plug to your printer', note that the fourth sentence should read:

The 13 Amp fuse supplied in a new plug must NOT be used.

**Page 30** - Underneath the program at the top of the page, the following print-out should appear:

```
 !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmno
pqrstuvwxyz{|}~  !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`
abcdefghijklmnopqrstuvwxyz{|}~
```

**Page 32** - At the bottom of the page, the following international character table should appear:

**CHARACTER CODE (HEX)**

| | &23 | &24 | &40 | &5B | &5C | &5D | &5E | &60 | &7B | &7C | &7D | &7E |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **USA** | # | $ | @ | [ | \ | ] | ^ | ` | { | ¦ | } | ~ |
| **France** | # | $ | à | ° | ç | § | ^ | ` | é | ù | è | ¨ |
| **Germany** | # | $ | § | Ä | Ö | Ü | ^ | ` | ä | ö | ü | ß |
| **UK** | £ | $ | @ | [ | \ | ] | ^ | ` | { | ¦ | } | ~ |
| **Denmark** | # | $ | @ | Æ | ø | Å | ^ | ` | æ | ø | å | ~ |
| **Sweden** | # | ¤ | É | Ä | Ö | Å | Ü | é | ä | ö | å | ü |
| **Italy** | # | $ | @ | ° | \ | é | ^ | ù | à | ò | è | ì |
| **Spain** | ₧ | $ | @ | ¡ | Ñ | ¿ | ^ | ` | ¨ | ñ | } | ~ |

**Page 73** - The example command (enclosed in a box) should read:

```
LPRINT CHR$(27)+ ":" + CHR$(Ø) + CHR$(Ø) + CHR$(Ø)
```

**Page 73** - At the bottom of the page, lines 80 and 90 of the program should read:

```
8Ø REM top and bottom of box
9Ø FOR i=1 TO 9
```

**Page 82** - The first paragraph should read:

Chapter 2 described how to adjust DIP switch DS1-7 to select the default character set, and also how to adjust DS1-1, DS1-2 and DS1-3 to select the required international characters. The following table indicates the functions of the remaining DIP switches:

**Page 82** - In the table of DIP switch functions, the entries for DS1-6 and DS2-7 should be amended as follows:

| | | | |
|---|---|---|---|
| DS1-6 | Alarm bleeper | Enable | Disable |
| DS2-7 | Auto loading | Enable | Disable |